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SCHULZE (B.). **Mykologische Prüfung der Tropeneignung organischer Werkstoffe, insbesondere von Holz.** [The mycological testing of organic manufacturing materials, especially wood, for adaptability to the tropics.]—*Holz Roh- u. Werkstoff*, v, 10, pp. 345–350, 1 fig., 1 graph, 1942.

The following technique is recommended for testing the resistance of wood and other materials to fungal decay in hot countries [cf. *R.A.M.*, xv, p. 333 *et passim*]. The wood samples, 5 by 2·5 by 1·5 cm. for Kolle flasks and 10 by 10 cm. for Petri dishes, are exposed for a period of four months to infection by pure cultures on malt agar of wood-destroying fungi, of which *Polystictus versicolor*, *Poria contigua*, and *Coniophora cerebella* [*C. puteana*] are the most suitable for hardwood tests and *Lenzites trabea*, *P. contigua*, *C. puteana*, and *Lentinus lepideus* for softwoods. The culture dishes are maintained in an atmosphere of 80 per cent. relative humidity and at a temperature of 28° C. The criteria used for the estimation of intensity of infection are loss of weight, evident disorganization, and (in particular cases) changes in specific properties of the sample, e.g., loss of strength. Each experiment is repeated at least twice, the weights of the samples being determined after drying at 105°. The wood blocks are sterilized by steam for 30 minutes before insertion in the flasks, one being laid directly on the mycelium and a second on an interposed glass bench, while a control block of a hard or softwood, according to the nature of the test, is also introduced into the culture. For materials such as paper, cardboard, and similar cellulose-containing fibrous products, *Lenzites trabea*, *P. contigua*, and *C. puteana* are used as inoculum, and the samples are dried at 20° with relative humidity of 65 per cent. Data obtained in the application of the method are given.

GREEN (D. E.). **Diseases of vegetables.**—vii+208 pp., 92 figs., London, Macmillan & Co. Ltd., 1943. 8*s.* 6*d.*

This manual is a revised and amplified version of the author's monthly articles in the Royal Horticultural Society's *Journal* [*R.A.M.*, xxi, p. 316], and is intended primarily for the small gardener. Technical terms have therefore been as far as possible omitted, though the scientific names of the pathogens are given, and attention is directed in the first instance to conspicuous symptoms facilitating the recognition of the diseases, which is further assisted by a useful key. Control measures are discussed in the fullest manner practicable.

HILDEBRAND (A. A.) & KOCH (L. W.). **Studies on blackroot of Sugar Beet seedlings.**—*Sci. Agric.*, xxiii, 9, pp. 557–567, 1 fig., 1943.

Serious reduction in stands of sugar beet seedlings is caused almost every year in Ontario by black root [*R.A.M.*, xix, p. 637; xxi, p. 60]. In greenhouse experiments conducted since 1941 with seed of a standard size (16/64 to 14/64 in.) planted in black-root infected Brookston clay loam soil in flats it was found that, at temperatures from 17° to 19° C., the greatest germination usually took place from the sixth to the ninth day after planting, inclusive. Disease symptoms

first appeared on the seventh or eighth day, and mortality of seedlings was greatest from the ninth to the thirteenth day. Seedlings which became infected after this initial period of high mortality, survived in a relatively high proportion and showed remarkable power of recovery. In tests with a commercial fertilizer (2–16–10) applied to the soil in flats at the rate of 400 lb. per acre, half of which amount was placed in a band in contact with the seed, and the other half in a band 1½ in. below and a little to one side of the seed, disease incidence was significantly greater in soil that was cultivated than in one that was not, irrespective of fertilizer treatment. Germination was poorest in soil that was cultivated but untreated, and highest in cultivated soil to which fertilizer had been added. Black root was less prevalent in treated than in untreated infested soil, regardless of whether or not the soil was cultivated. Treatment of seed with ceresan and nomersan [ibid., xxii, p. 259] dusts afforded the seedlings a considerable measure of protection against the pre-emergence phase of damping-off, producing stands with 10 per cent. more healthy seedlings than in the case of no treatment, but failed to protect them sufficiently during the post-emergence phase to ensure profitable stands.

The most potentially important results from the practical standpoint were obtained with green manure in the form of cover crops. A germination percentage (expressing the total number of seedlings which appeared as a percentage of the number of seed clusters sown) of 207 followed the incorporation of maize into the soil, and one of 192 that of soy-bean, while untreated soil showed one of only 82 and steamed soil one of 234. Disease incidence after maize and after soy-bean was 7·6 and 10·4 per cent., respectively, as compared with 79·7 per cent. in untreated and 16·9 per cent. in steamed soil. The vigour of seedlings in soy-bean-treated soil was far superior to that in the other two series; the weight of 150 seedlings grown in the soy-bean-treated soil was almost three times that of similar numbers grown in either maize-treated or steamed soils. Diseased seedlings grown for two months in the greenhouse and then transplanted to an outdoor plot all recovered and gave a yield of only about 15 per cent. less than that from initially healthy seedlings.

Vižnevski (V. P.). **The quality of catalase in the Beetroot, and the resistance of Sugar Beet to Botrytis cinerea during storage.**—*Biohimija*, v, pp. 408–416, 1940. [Abs. in *Plant Breed. Abstr.*, xiii, 3, pp. 245–246, 1943.]

Resistance to *Botrytis cinerea* in stored beet roots [*R.A.M.*, xx, p. 332] was found to be directly correlated with an excess of nitrogen and with enzymatic activity. In the resistant roots marked differences in the activity of the enzymes of the various tissues were recorded, whereas no such disparities were observed in the diseased material. The higher the enzymatic activity, the lower was the content of transferable nitrogen and sugar. The amounts of non-protein nitrogen and monosaccharide were larger in resistant than in susceptible roots. The qualitative differences between the enzymes of resistant and non-resistant roots are indicative of variations in vitality.

Townsend (G. R.) & Wade (B. L.). **Close-up of something new in Snap Beans. Two varieties developed for Florida resist rust, mildew, common mosaic and are heat and drought tolerant.**—*Sth. Seedsm.*, vi, 3, pp. 9, 40, 1943. [Abs. in *Plant Breed. Abstr.*, xiii, 3, p. 268, 1943.]

The Florida Belle and Florida White Wax varieties, the former a selection from Stringless Black Valentine × a sib of U.S. No. 5 Refugee, back-crossed with Stringless Black Valentine, and the latter a selection from Brittle Wax × a sib of U.S. No. 5 Refugee, have been found to combine resistance to some forms of rust [*Uromyces appendiculatus*] and mildew [*Erysiphe polygoni*] with tolerance of heat and drought and other attractive qualities.

DAINES (R. H.). **Thiosan (tetramethyl thiuramdisulfide) and scurf control of Sweet Potatoes.**—*Phytopathology*, xxxiii, 5, pp. 410–412, 1943.

From the data obtained in tests at the New Brunswick Agricultural Experiment Station, New Jersey, in 1942, thiosan (tetramethyl thiuramdisulphide) at the rate of 1 lb. in 5 gals. water, applied as a sprout dip, proved equally effective with semesan bel for the control of severe scurf (*Monilochaetes infuscans*) in sweet potatoes grown in a heavy sassafras loam soil. These results are of considerable interest in connexion with the prevailing scarcity of mercury and the consequent need for efficient plant-protective substitutes. Spergon afforded only a moderate degree of control [*R.A.M.*, xxi, p. 515].

RAYCHAUDHURI (S. P.). **A disease of Pigeon Pea [Cajanus cajan (L.) Millsp.] caused by Diplodia cajani spec. nov.**—*Indian J. agric. Sci.*, xii, 6, pp. 837–847, 4 figs., 1942.

A species of *Diplodia*, apparently distinct from any hitherto described, was isolated from cankered pigeon pea plants of the 1939 and 1940 crops received from the Imperial Agricultural Research Institute, Pusa, and is named *D. cajani* n. sp. The fungus is characterized by an olive-green to brown (black in the mass) mycelium, 2·6 to 8·6 (average 4·3) μ in diameter; globose, ostiolate, erumpent pycnidia, 301 to 464 (405) μ in diameter; and bicellular, ovate, sometimes ovoid to ellipsoid conidia, 21·5 to 30·1 by 10·8 to 12·9 (25·1 by 12·7) μ, attached by the narrower end to short, needle-shaped, pale to dark brown conidiophores. The upper cell of the conidium invariably germinates first, producing a germ-tube in five hours, while a period of 15 to 20 hours is required by the lower cell for the same process.

The primary symptoms of the disease are thickening and distortion of the collar region, developing after 20 to 30 days into large, deep-seated cankers, which usually spread and girdle the stem, causing the collapse of the plant, though partial recovery through callus formation occasionally takes place. The cankered portion of the stem is often twisted owing to the unequal development of the wood, and in advanced stages of infection the internal tissues, a few inches above the lesion, are discoloured; at this site adventitious roots are produced. Microscopic examination of the slate-blue tissues (likewise a feature of the similar disease of pigeon pea described by Leach and Wright from Trinidad [*R.A.M.*, ix, p. 622]) revealed the presence of mycelium in the primary and secondary xylem vessels.

Positive results were obtained in inoculation experiments with pure cultures of four isolates of *D. cajani* on wounded and unwounded plants, the severity of the symptoms being greatly increased by previous injury to the collar.

The minimum, optimum, and maximum temperatures for the growth of the fungus on potato dextrose agar (the best of the media tested) were below 20°, 30°, and above 35° C., respectively.

JENKINS (ANNA E.) & BITANCOURT (A. A.). **Gouirand and Bergeron's treatment of Sphaceloma ampelinum.**—*Mycologia*, xxxv, 3, pp. 272–276, 1 fig., 1943.

Attention is drawn to a little known account of *Sphaceloma ampelinum* [*Elsinoe ampelina*: *R.A.M.*, xii, p. 595] published in 1897 by Gouirand and Bergeron, and their original line cuts are reproduced from photographs. In this account there are descriptions of stem cankers in autumn and of stages in the development of sclerotia and the manner of conidial formation from them in the spring. Jaczewski, who cites Gouirand and Bergeron, states that the sclerotia appear at the close of summer and correspond to the conidial layers that have reached a period of rest. According to him these sclerotial formations are retained in the old wounds for several years, forming each spring a new hymenial layer of conidiophores on their surfaces.

With regard to the doubt expressed by Gouirand and Bergeron and other workers, whether more than one spore can be produced from a conidiophore of *E. ampelina*, the authors maintain that descriptions and illustrations by Gouirand and Bergeron and others all point to successive and abundant production of conidia.

HUSFELD (B.). **Zur Züchtung krankheitswiderstandsfähiger Kulturpflanzen.** [A contribution to the breeding of disease-resistant cultivated plants.]—*Angew. Bot.*, xxv, 1–2, pp. 115–125, 1 fig., 1943.

Some recent outstanding contributions to the breeding of cultivated plants for resistance to specific diseases are discussed, with special reference to the work now in progress at the Müncheberg Plant Breeding Institute on the development of immunity from vine downy mildew (*Plasmopara*) [*viticola*: *R.A.M.*, xviii, p. 435]. The relation of the stage of maturity of the host to the intensity of infection has been the subject of investigation in various crops, and inoculation experiments on vine seedlings of different ages threw further light on this problem. It was observed that the selective process is more active among plants inoculated in the first and second true leaf stage than at the fifth and sixth, resistance increasing from a given phase onwards and being governed by the same hereditary factors as any other character. This type of resistance is maintained and even enhanced under field conditions.

There is another form of resistance to *P. viticola* which is dependent on the temporary state of health of the host at the moment of inoculation. For instance, an apparently resistant seedling, inoculated after re-potting, will not react by the formation of minute necrotic spots round the stomata characteristic of the same plant in an undisturbed condition, but will succumb more or less completely to the attack of the pathogen. In cases of this kind, it is not resistance itself that is inherited, but merely the capacity for responding in a certain manner to a given set of external conditions.

The main object of future plant-breeding research must, in the writer's opinion, consist in the development of 'biotype-proof' characters for resistance, so that the risk of infection by divergent physiologic races of a pathogen would be eliminated.

Agricultural Research in Utah. Report of the Agricultural Experiment Station, July 1, 1940, to June 30, 1942.—*Bull. Utah agric. Exp. Sta.* 306, 110 pp., 7 pl., [? 1942].

In this report on plant disease work in Utah from 1940 to 1942 [cf. *R.A.M.*, xx, p. 345] it is stated that there were highly significant differences in yield between 25 lucerne varieties tested for resistance to wilt (*Phytomonas* [*Corynebacterium*] *insidiosum*) [ibid., xxi, p. 527]. Of the four giving the highest yields, three were strains of Utah Station selections.

Further studies demonstrated that the condition known locally as lucerne 'stem blight' is two distinct diseases: a bacterial stem blight apparently identical with *Phytomonas* [*Pseudomonas*] *medicaginis* and a fungal disease, 'black stem', which is due to *Ascochyta imperfecta* [ibid., xviii, p. 11; xxi, p. 528]. Black stem in Utah appears to be identical with the disease of the same name in Idaho and Kentucky. In the later stages of the disease, the lesions produced by the bacterial organism may be completely invaded by the fungus.

Of the six races of wheat bunt [*Tilletia foetida* and *T. caries*] found in Utah and southern Idaho, only three occur very frequently. The race affecting Oro wheat is rather prevalent. Five races of loose smut [*Ustilago tritici*] have been isolated from collections made in Utah. Genetic studies of resistance to loose smut and bunt in wheat revealed marked transgressive segregation.

Tomato bacterial canker (*Aplanobacter* [*Corynebacterium*] *michiganense*) [ibid.,

xx, p. 345] continues to be effectively controlled by treating seed from infected sources with acetic acid or by extraction of the seed from pulp after fermentation [ibid., xxi, p. 353], subsequent rapid drying reducing the loss of germinability.

In further work on tomato curly top (caused by sugar beet curly top virus) [ibid., xxi, p. 230; xxii, p. 44], large-fruited selections from crosses of resistant strains of Ojo de Venado and Red Peach with commercial varieties, chiefly Stone, Baltimore, and Century (all forms of *Lycopersicum esculentum*) were obtained for the first time in 1941, and strains of *L. glandulosum*, *L. peruvianum* var. *lumifusum*, and *L. p.* var. *dentatum*, that are almost immune, are being used in an intensive breeding programme. In tests of the effectiveness of different cultural methods on curly top control, the highest percentage of diseased plants in 1940 (81 per cent.) occurred in controls planted at the usual time (10th May) and with the customary spacing (42 in., one plant per hill). These plants gave one of the smallest yields (4·8 tons per acre). The least (25·5 per cent.) occurred in early planting (20th April), spaced 21 in. apart, one plant per hill, paper caps being used to afford protection against frost; these plants also gave the highest yield (19·4 tons per acre) [ibid., xxi, p. 103]. In 1941, control plots gave 16 per cent. disease and 6·1 tons per acre. Those planted at the same time, but spaced 21 in. apart showed 12 per cent. curly top and gave 8·3 tons per acre. Late sowings spaced 42, 21, 10·5, and 6 in. apart gave, respectively, 14, 11, 5, and 3·7 per cent. curly top and yields of 2·6, 3·8, 7·1, and 9·7 tons per acre. Direct seeding in 1940 gave inconclusive results. When the effect of planting at different times was investigated (10½ in. spacing), earliness was found to favour higher yields and to give less disease. Of all the irrigation methods tested, irrigation at some date after seeding (depending on soil moisture) in regular furrows appeared to give the best results. When sunlight intensity during growth was reduced by shading from 10,000 to under 2,000 foot candles the percentage of curly top in three tests fell from 51·9, 53·8, and 73·1 to 3·7, 8·8, and 7·4, respectively. Nutritional studies indicated that nitrogen may stimulate curly top.

Chlorosis of fruit trees was not satisfactorily controlled by soil treatments with acid-forming materials and minor elements. Iron sulphate sprays and injections of iron phosphate produced improvement, but occasionally the spraying was followed by heavy leaf drop. Injections gave more promising results than soil or spray treatments. Some trees injected with iron phosphate in late spring shed a few leaves, but in most cases recovery was satisfactory. Injections, however, had small effect after one season.

Soil treatments with acid-forming materials and minor elements failed to give satisfactory control of little leaf [of fruit trees], though in peach, cherry, and apple orchards the condition was controlled by zinc sulphate sprays, by zinc sulphate injections, and by the insertion of zinc tacks in the trunk. Occasionally, the symptoms reappeared the second summer after treatment. The zinc content of affected leaves was only about one-third that of normal leaves.

In 1941, western 'X' disease of peaches [ibid., xxii, p. 32] was found on 47 per cent. of the trees in 15 six- to twenty-year-old orchards. It occurs in high concentrations (up to 80 per cent. of the living trees) in six counties in Utah. The evidence indicates that nursery stock may be a means of distribution.

Rasp leaf of sweet cherry [ibid., xxii, p. 257], first discovered in Utah in June, 1941, is now known to be present in a severe form in three orchards in Davis County. Artificial transmission was obtained by bud graft inoculation.

A condition affecting cherry trees, and referred to as 'ring spot' or 'lace leaf', in which almost all the mesophyll tissues of the leaves become necrotic and fall out, was first observed in Utah in 1939. In August of that year, 20 young, healthy Bing cherry trees were inoculated with buds from affected trees, and 18 of these showed the condition in 1941.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, liv, 5, pp. 223–226, 5 figs., 1943.

During the past season, partial failure of several transplanted carrot and beet seed crops followed collapse and rotting of the main storage roots in New South Wales. After being selected for colour and shape, the roots were transplanted as soon as possible, and they appeared to start well. Many plants produced an apparently normal seed stalk, and some flowered well, but after this, further development ceased, and the seed stalks withered and collapsed. The seed roots were found to be badly shrunken, and had developed only a meagre root system after transplanting. No organism of primary importance was associated with the condition, which is attributed to the selection by growers of over-mature roots of high sugar content as seed roots.

Bacterial blight of carrots (*Pseudomonas* [*Xanthomonas*] *carotae*) [*R.A.M.*, xxii, p. 88] was observed twice in three months (once on a seed crop), probably having been recently introduced on seed from overseas. The symptoms on the leaves are irregular, dark brown spots on the segments, sometimes with a lighter halo; the leaf stalks show short brown streaks. Under conditions favouring infection, the older leaves may be killed and wither up. Severe leaf spot may reduce the yield, but light infection does not appear to affect it materially. The damage to seed crops is likely to be a more serious source of loss. Roots for seed production should be taken from a clean crop, and land which has borne an affected crop should not be used for carrots the following year.

Rhubarb wilt or crown rot (*Phytophthora parasitica*) [ibid., xv, p. 281] is recorded for the first time from New South Wales, but is so widespread that it has probably been present for some years. The disease requires hot, wet conditions; it is most common in heavy soils, and occurs first in any depression in the field where water remains. The beds should be well drained and not watered excessively. Once the disease has occurred, rhubarb should not again be grown in the affected bed for some years.

Against *Clasterosporium carpophilum* on stone fruit trees spraying with Bordeaux mixture (6–4–40) plus a spreader is recommended; the operation should be carried out when the leaves fall in autumn, and in early spring, when a trace of petal colour is visible in the swollen blossom buds. Pruning out the infected twigs is also advised.

Plant diseases and insect pests. Notes by the Biological Branch.—*J. Dep. Agric. Vict.*, xli, 6, pp. 312–316, 7 figs., 1943.

For many years past, onion white rot (*Sclerotium cepivorum*) [*R.A.M.*, xxi, p. 213] has caused serious losses in metropolitan market gardens in Victoria, and the disease now appears to be spreading in the country districts. The fungus is generally introduced into clean areas by means of diseased seedlings or sets. Infection develops most rapidly at soil temperatures of 60° to 70° F., which normally occur during late autumn and spring. At soil temperatures over 75° the development of the disease is entirely inhibited. In country districts farmers should discontinue onion-growing on infected land for an indefinite period, or lengthen the rotation between onion crops; infected bulbs should be burnt, and no infected refuse should be fed to stock. In market-gardens, on the other hand, the parasite could be readily controlled in the seed-beds by sterilizing the soil with formalin.

To control rhubarb downy mildew (*Peronospora jaapiana*) [ibid., xv, p. 422] the lower leaves of affected plants should be stripped off, exposing the crowns, and the plants should be thoroughly sprayed with Bordeaux mixture (4–4–40), care being taken to drench the under surfaces of the leaves. Treatment should be repeated at intervals of two or three weeks throughout spring and early summer.

Brief notes are also given on gladiolus bacterial scab [*Bacterium marginatum*: ibid., xx, p. 558].

Michaelis (M.), Levi (I.), & Hibbert (H.). **Differential inhibition between normal and tumor (crown gall) tissue in Beet roots.**—*Science*, N.S., xcviii, 2534, pp. 89–90, 1943.

The authors observed a clear difference in the action of resorcinol and of cyanide upon the rate of oxygen uptake in the tissues of normal beets and of beet root tumours resulting from inoculation with *Phytomonas* [*Bacterium*] *tumefaciens*. With normal tissue an inhibition of 12 to 14 per cent. was obtained with 0·0166 M resorcinol, while in tumour tissue the figure was 20 to 23 per cent. Cyanide in concentrations of 0·0166 M inhibited the oxygen uptake by 84 to 86 per cent. in normal, and by 79 to 80 per cent. in tumour, tissue. Other studies in the same laboratory had shown a differentiation between the healthy part and the tumorous part of the same beet, whereas this work revealed a differentiation between tumorous tissue and the tissue of a completely healthy non-infected beet root. When cyanide was added to resorcinol and vice versa, with both healthy and tumorous beet root tissue inhibition was increased by 6 to 8 per cent. above that due to cyanide alone.

These results indicate that both tumours and healthy beets may have a cyanide-insensitive respiratory system, a resorcinol-insensitive system, and a cyanide-plus resorcinol-insensitive system, as well as the corresponding sensitive systems, the relative proportions of the three systems in tumour and healthy tissue being different. They also suggest that the inhibitions induced by cyanide and by resorcinol function to some extent independently. Possibly, different active centres of the same enzyme may be attacked by both inhibitors, but to a different degree.

Weiss (F.) & Wood (Jessie I.). **A list of names and synonyms of phytopathogenic bacteria occurring in the United States embodying recent changes in nomenclature.**—*Plant Dis. Reptr*, xxvii, 2, pp. 42–62, 1943. [Mimeographed.]

The authors list the names of phytopathogenic bacteria [cf. *R.A.M.*, xxi, p. 364], that have been adopted by the Plant Disease Survey pending the appearance of a new edition of Bergey's Manual [ibid., xix, p. 203]. Synonyms are given, and an index of specific names is provided.

No change is made as regards *Erwinia*. Because of the confused status of the name *Bacterium*, it is employed in the present list only for species not allocated to other genera. All species of *Phytomonas* (except two so far not transferred elsewhere and four recently added) are reduced to synonymy. The genus *Agrobacterium* [ibid., xxii, p. 344] is accepted for *A. rhizogenes* (Riker *et al.*) Conn (*Bact. rhizogenes*) and *A. tumefaciens* (E. F. Sm. & Town.) Conn, but the transference of *Bact. stewarti* to *Xanthomonas* is not approved; *Corynebacterium* is adopted for the seven plant pathogens so far transferred to this genus, the combination *C. sepedonicum* (Spink & Kotth.) Skapt. & Burkh. published in May, 1942 [ibid., xxi, p. 469] antedating that made by Dowson in June, 1942 [ibid., xxi, p. 365].

Posnette (A. F.). **Control measures against swollen shoot virus disease of Cacao.**—*Trop. Agriculture, Trin.*, xx, 6, pp. 116–123, 1943.

In this report on the results obtained in the control of cacao swollen shoot [*R.A.M.*, xxii, p. 13] at the Central Cocoa Research Station, Tafo, Gold Coast, the author points out that spread may occur gradually, by the infection of trees adjacent to others already diseased, no healthy tree remaining inside the affected area, or it may take place also by new outbreaks some distance away from the main one; these enlarge like the original one, the rate of spread increasing until the whole farm is destroyed. These subsidiary outbreaks probably arise from the dispersal of insect vectors from the original one, but they may, possibly, be fresh infections from an alternate host. In an isolated outbreak in which both methods

of spread were allowed to take their course, the affected area increased from 1,000 sq. yds. in 1937 to 20,000 sq. yds. in 1943.

In the experimental area (near the edge of the most heavily infected locality), which comprised about 70 acres of trees 5 to 30 years old, the first outbreak was noted in December, 1938. An eradication campaign was begun in February, 1940, when 11 outbreaks affecting 55 trees were known. All the trees showing characteristic swellings were cut down and stumped, but this method proved a failure. In February, 1941, when there were 28 outbreaks, a ring of apparently healthy trees was removed from 24 treated outbreaks. This proved more effective. After May, 1941, each plot was inspected every month, and any infection appearing after an old outbreak had been free for six months was regarded as a new outbreak. On this assumption, 39 outbreaks had been cleared up by March, 1942, and only four were still spreading.

The roguing of infected trees in 1940 and 1941 eliminated the virus from the Station cacao, but failed to reduce the number of new outbreaks, the increase in which from 10 in 1939 to 50 in 1942 indicates that infection is rapidly becoming more concentrated in the Tafo area. In 1942–3, continued treatment eradicated the disease from all but three of the 75 outbreaks treated over six months earlier. The total number of infected trees fell from nearly 400 in 1940 to 133 in 1942–3, in spite of the increase in the number of outbreaks. It appears that some outbreaks affecting not more than six trees can be controlled without the removal of apparently healthy trees.

An experiment was carried out on native farms to test practicable improvements in these routine methods, including the removal of two rings of healthy trees instead of one, burning the leaves and green wood immediately after felling, and nicotine-spraying before and during felling. None of these methods appeared likely in one operation to eliminate the virus from extensive areas.

The results of the investigation are considered to justify the official eradication campaign, in which the fringes of the infected areas are surveyed, and as isolated outbreaks appear, all the newly infected trees, with a ring of apparently healthy ones, are cut down and stumped, growers being compensated only for the healthy trees. The present control measures, however, can do no more than delay the destruction of the cacao. It is to be hoped that a resistant variety will eventually be found.

Vallega (J.). **Razas fisiológicas de Puccinia triticina y P. graminis tritici comunes en Chile.** [Physiologic races of *Puccinia triticina* and *P. graminis tritici* common in Chile.]—*Tec. Bol. Minist. Agric. Chile* 3, 32 pp., 3 figs., 1942. [English summary. Abs. in *Exp. Sta. Rec.*, lxxxix, 2, p. 226, 1943.]

Of the four physiologic races of *Puccinia graminis tritici* collected on wheat in Chile during 1940, viz., 14, 15, 17, and 11 [*R.A.M.*, xxi, p. 188], the first was the most virulent. Race 68 of *P. triticina* was the most prevalent and widespread, but 15 and 114 (the latter new and highly pathogenic to seven of the eight differential varieties) were also present. Although the same races of stem and leaf rusts occur in Chile and the La Plata region, none of the Chilean races of *P. triticina* has hitherto been detected in the Argentine, Uruguay, or Brazil. Among the wheat varieties grown in Chile are many factors for rust resistance which it is hoped to utilize for breeding purposes.

Hart (Helen) & Allison (J. L.). **A browning reaction to stem rust in Wheat.**—*Phytopathology*, xxxiii, 6, pp. 484–496, 4 figs., 1943.

The browning reaction of wheat to infection by *Puccinia graminis tritici* consists of a deep brown discoloration of the host tissue about the infection centre, usually accompanied by reduced sporulation of the rust. Studies on this type of reaction

showed that it is found only in certain wheat varieties (e.g., Vernal emmer, Arnautka, Kubanka, Kota, and Kanred), but is not a varietal character, its expression depending on the race of rust and the environmental conditions. During the three or four years it was observed that whenever collections of race 34 were cultured in the greenhouse, browning was frequent. This race, whether collected from wheat or barberry, appeared capable of inducing the reaction in a greater number of different wheat hosts than any other race tested. Temperatures above 28·5° C. were ascertained to be the primary environmental condition directly responsible for browning. High relative humidity enhanced the effects of high temperature.

Histological studies demonstrated that in the browned area of most hosts most of the haustoria were dark, thick-walled, and very numerous. Near the outer margins of mycelial development, the cell walls were discoloured in groups of 5 to 15; the host cell walls were brown and slightly thickened in many instances. The tips of some of the intercellular hyphae were discoloured and sometimes transformed and ensheathed, as were the haustoria. The transformed parts showed a striking resemblance to uredospores and teleutospores. When the uredospores of race 34 germinated at high temperatures, some tendency towards spore-like encystment of the germ-tubes was noted.

In resistant hosts the browning reaction is only an added indication of resistance, whereas in susceptible hosts a severe reaction of this type may denote a definite shift from susceptibility to resistance. It is possible that such a variation as this browning reaction has been one of the factors responsible for the fact that race 34 no longer plays an important part in stem rust epidemics in the Mississippi Valley.

Johnson (T.) & Newton (Margaret). **The inheritance of a mutant character in Puccinia graminis tritici.**—*Canad. J. Res.*, Sect. C, xxi, 7, pp. 205–210, 1 pl., 1943.

A study was made at Winnipeg, Canada, of the inheritance of an abnormal characteristic of *Puccinia graminis tritici*, originally encountered in 1934 in a culture of race 21, namely, the production on barberry of white haploid pustules that develop few or no pycnidia and rarely produce aecidia but occasionally give rise to uredosori and teleutosori [*R.A.M.*, xvi, p. 520]. Of the pustules produced in cultures of race 21, 52·6 per cent. were normal and 47·4 per cent. were white. In selfing and crossing experiments with races 21, 11, 17, and 48, it was demonstrated that diploidization of the mycelia of normal pustules by pycnospores from white pustules initiated physiologic races that produced white and normal pustules on the barberry in approximately equal numbers; normal × normal matings produced normal races; and white × white matings were sterile. Uredosori which occasionally arose in white pustules as a result of diploidization by either pycnospores or mycelia of normal pustules also gave rise to physiologic races which produced white and normal pustules in about equal numbers. It thus appears that the production of white pustules is not restricted to one particular physiologic race or to one sex. It is assumed that a mutation affecting one of the conjugate nuclei took place in the original culture of race 21 and that, during meiotic divisions in the germinating teleutospore, the mutant factor is segregated so that half the sporidia give rise to white and half to normal pustules.

Wöstmann (E.). **Der fluorescenzoptische Nachweis von Ustilago tritici im Weizenkorn.** [The detection of *Ustilago tritici* in the Wheat grain by optical fluorescence.]—*Kühn-Arch.*, lvi, pp. 247–253, 1942. [Abs. in *Chem. Zbl.*, cxiv (i), 14, p. 1485, 1943.]

The mycelium of *Ustilago tritici* was found to be discernible in the wheat grain

by means of fluorescence microscopy. Of the various dyes tested, the most effective were coriphosphin (in alkaline solution for the staining of the embryo) and fuchsin (in acid solution for the after-treatment of the mycelium). The infected grain is soaked for four to six hours, whereupon frozen microtome sections, 40 μ thick, are placed on a slide with a drop of sodium phosphate solution, stained for two minutes with coriphosphin (1 in 1,000 in sodium phosphate), rinsed, re-stained for 15 seconds in fuchsin (1 in 10,000 in potassium dihydrogen phosphate), and again rinsed. The preparation is then embedded in glycerine, and on inspection the next day through fluorescent light the mycelium appears a vivid reddish-purple in contrast to the greenish-yellow embryonic tissue.

White (N. H.) & McIntyre (G. A.). **The pathogenicity of single spore isolates of Ophiobolus graminis under field conditions.**—*J. Coun. sci. industr. Res. Aust.*, xvi, 2, pp. 93–94, 1943.

In a preliminary experiment carried out at Canberra to test the pathogenicity under field conditions of eight isolates of *Ophiobolus graminis* derived from eight ascospores from a single ascus, sites were selected in a field which two years before had carried a crop of wheat affected by take-all, but which had lain fallow the year before. The isolates were introduced into the soil in three types of inoculum, (*a*) straw, (*b*) oat-barley, and (*c*) soil. Two adjacent sites were selected, one being on a light-coloured, and the other on a dark-coloured, sandy loam.

Statistical analysis of the percentages of diseased wheat plants in the different treatments showed that variations in pathogenicity of the eight isolates [*R.A.M.*, xxi, p. 520] were significantly different for a particular medium, that those relative differences were not the same for different media, and that the effectiveness of the inoculum varied with site conditions.

Sallans (B. J.) & Ledingham (R. J.). **An outbreak of common root rot in south-western Saskatchewan in 1942.**—*Sci. Agric.*, xxiii, 10, pp. 589–597, 1 fig., 3 graphs, 1943.

An unusually severe outbreak of common root rot of wheat [*R.A.M.*, xxii, p. 200] is reported from south-western Saskatchewan, Canada. A study of the disease showed that while the root-rot fungi, *Helminthosporium sativum* and possibly *Fusarium* spp., were primarily responsible for the outbreak, other factors, such as drought and perhaps wind erosion and soil variations, were undoubtedly contributory to the intensity of the attack. Throughout the study square yard samples from apparently healthy areas were used as standards of comparison with paired samples from diseased patches in the same field, but it is pointed out that the areas designated as healthy in appearance were actually also diseased, though to a lesser degree, and had probably suffered some reductions in yield. The prematurely ripened, stunted, and discoloured plants from diseased patches were found to yield about half as much grain as those from apparently healthy ones, and the weight per thousand kernels of diseased plants was lower by about 28 per cent. The losses in yield in diseased patches ranged from 8 to 42 per cent. of what the yield might have been if the fields were uniformly like the apparently healthy areas. Common root-rot ratings were much higher for the diseased areas than for the apparently healthy ones, indicating that a straight-line relation exists between yield and disease ratings.

Glynne (Mary D.) & Ritchie (Wendy M.). **Sharp eyespot of Wheat caused by Corticium (Rhizoctonia) solani.**—*Nature, Lond.*, clii, 3849, p. 161, 1943.

Lesions on wheat somewhat resembling those due to *Cercosporella herpotrichoides*, but less regular, have been recognized at Rothamsted as symptomatic of a different

disease since 1935. This was described and figured in Holland by Oort under the name 'sharp eye spot' in the course of his paper on *C. herpotrichoides* [*R.A.M.*, xvi, p. 29], though he did not identify the causal organism. Sprague found a species of *Rhizoctonia* causing similar symptoms in Oregon [ibid., xvi, p. 801]. Blair observed that some Canadian strains of *Corticium solani* when inoculated into wheat caused a stem girdling, the photographs of which resemble sharp eye spot [ibid., xxi, p. 412].

The authors have obtained wheat plants with sharp eye spot resembling that figured by Oort, Sprague, and Blair from many places in England and Wales, and have consistently isolated a fungus of the *Rhizoctonia* type. Wheat seedlings inoculated with six isolates from four localities produced sharp eye spot lesions from which *C. solani* was re-isolated. Sharp eye spot lesions are more superficial than ordinary eye spot and may be confined to the outer sheaths, though they may penetrate the straw. They frequently run several inches up the stem. They are asymmetrical, with sharply defined borders surrounding pale areas on which patches of light, later brown or purple, mycelium grow and spread. Sharp eye spot is seldom present in England and Wales in more than 1 per cent. of the straws, though one heavily infected crop has been reported. It does not increase with the frequency of wheat or barley in the rotations. It is as common in the first wheat crop after grass as it is on old arable land.

Immer (F. R.) & Christensen (J. J.). **Studies on susceptibility of varieties and strains of Barley to Fusarium and Helminthosporium kernel blight when tested under muslin tents or in nurseries.** *J. Amer. Soc. Agron.*, xxxv, 6, pp. 515–522, 1943.

Strains and varieties of barley, including Peatland, Velvet, Barbless, and a number of crosses between Minn. No. 462 and Peatland, were tested separately from 1937 to 1939, at the Minnesota Agricultural Experiment Station, both in a muslin tent and in a field nursery for their reaction to head or kernel blight, caused principally by *Helminthosporium sativum* and *Gibberella zeae*, one of the most destructive diseases of the crop in the north-central United States [*R.A.M.*, xiv, p. 503].

In seven out of ten tent tests a significant negative regression of blight on date of heading was obtained, the coefficients varying from +0·7214 to −7·0868, indicating that as the date of heading was delayed one day, the average reduction in the incidence of infection was 7 per cent. In nine out of the ten trials the strains differed significantly in their response to the pathogens after adjustment for date of heading to obviate the selection of late-heading but not necessarily blight-resistant strains. In tent and three nursery tests on 18 varieties or strains Peatland developed a relatively low percentage of infection in all the tests (0 to 42, compared with 5 to 90 and 15 to 86 for Velvet and Barbless, respectively). The strain H–31–71 (Minn. No. 462 × Peatland) was slightly more susceptible than the latter parent (2 to 53 per cent.), but showed less than the average infection of all strains in seven out of eight tests, whereas H–31–16 of the same cross had a higher percentage of both types of blight in the same number of trials (12 to 98). Generally speaking, there is a correlation between resistance to *H. sativum* and *G. zeae*, so that the same technique may be used for testing varietal response to both pathogens.

Yu (T. F.). **Breeding hulled Barley for resistance to covered smut [Ustilago hordei (Pers.) K. and S.] in Kiangsu Province.** —*Nanking J.*, ix. pp. 281–292, 1940.

Covered smut of barley (*Ustilago hordei*) is stated to cause a loss of 1,000,000 to 1,500,000 bush. grain in Kiangsu Province annually. A detailed study was made

of the pathogenicity of 280 collections on three varieties, Hanna, Nanking 373, and Saitamachadaha. Five different races were found and named C–1, C–2, C–3, C–4, and C–5, the first two being closely related in pathogenicity and comprising 93·2 per cent. of all the collections. The three remaining forms were found chiefly in the northern part of the province.

Out of more than 9,000 individual heads of Chinese barley selections, 54 lines were found resistant, of which nine yielded more heavily than the check (a productive strain grown extensively in Kiangsu). Selections from the progeny of Manchuria (C.I.957) × No. 4326 (a local selection) also yielded resistant types. Seven such hybrids, named Nanking 555, 557, 562, 575, 580, 592, and 593, all yield highly and mature earlier than Manchuria. The variety Nanking 593 is considered the most promising.

Twyman (E. S.). **Manganese deficiency in Oats.**—*Nature, Lond.*, clii, 3851, p. 216, 1943.

With the help of the water culture technique of Stout and Arnon (*Amer. J. Bot.*, xxvi, p. 144, 1939) the author succeeded in producing typical symptoms of grey speck disease [*R.A.M.*, xxi, p. 522] in oats plants grown in culture solutions deficient in manganese. The experimental results also suggest that in addition to the four generally recognized trace elements, manganese, zinc, boron, and copper, one or more elements from among aluminium, molybdenum, titanium, vanadium, tungsten, nickel, and cobalt are probably essential for the growth of oats.

Dillon Weston (W. A. R.) & Taylor (R. E.). **Stripe smut of Rye.**—*Nature, Lond.*, clii, 3849, pp. 160–161, 1943.

Infection of rye by stripe smut (*Urocystis occulta*) [*R.A.M.*, xx, p. 569] has been observed on several occasions lately in Norfolk, some 80 acres being moderately affected on one farm. The disease is rare in Great Britain, and has not been observed by the senior writer for 20 years in East Anglia. It appeared, however, at Rothamsted in 1932, and a small amount was found near Romsey, Hampshire, in 1920, and at Askham Bryan, Yorkshire, in 1936. Rye seed should be preventively treated with a reliable organo-mercuric dressing against this and other diseases; where the disease is found, rye should not be grown in the same field the following season.

Thomas (K. M.) & Ramakrishnan (T. S.). **Experiments on ergot production in Madras.**—*Madras agric. J.*, xxx, 12, pp. 411–416, 4 figs., 1942.

After referring to the discovery of ergot sclerotia near Simla, India, in 1941 on *Brachypodium sylvaticum*, *Oplismenus compositus*, and *Andropogon* (?) *gryllus*, belonging probably to *Claviceps purpurea* or *C. pusilla* [*R.A.M.*, xxi, p. 206], the authors state that following the appeal of the British Ministry of Health in 1941 for large quantities of ergot, several parts of the Empire made trials in ergot culture by means of the artificial inoculation of rye flowers [cf. ibid., xxii, p. 300]. 'The rye fungus not being recorded in India, cultures of the fungus were obtained in April, 1942, from Australia and exploratory experiments were carried out at the Agricultural Research Station, Narjanad.' The fungus was multiplied on a variety of media, over 2½ acres of rye were sown, and inoculation by spraying carried out in mid-July and again on the 11th August. Fifteen days after the second spraying several sclerotia were found, and infection subsequently spread over the whole field, including the unsprayed blocks. Infection was heaviest in the fields that flowered last. The yield figures showed that up to 120 lb. of sclerotia (wet weight), equivalent to 95 lb. of sun-dried sclerotia, could be produced per acre under favourable conditions. The alkaloid content compared very favourably with that of the best European ergots.

The best culture medium for the fungus was found to be that recommended by Kirchhoff [ibid., viii, p. 560], while another good one was that used by Kreitmair and Küssner [ibid., xi, p. 38], consisting of rye meal, asparagin, glycerine, and water, and a third was one composed of sterilized immature panicles of sorghum, *Setaria italica*, and *Pennisetum typhoides*. The optimum growth temperature was about 20° C.

The cost of production under optimum conditions on the Nilgiris will apparently work out at about Re 0-4-0 per pound of dried ergot. Estimating the yield at only 50 lb. per acre and the selling price 6 rupees per pound, the gross return per acre would be 300 rupees.

Diplodia ear rot of Maize.—*Trop. Agriculturist*, xcviii, 3, p. 36, 1942.

Maize cobs from an up-country estate in Ceylon were found to be rotted and blackened as a result of infection by *Diplodia frumenti* [*R.A.M.*, xvii, p. 670]. This is the first record of the fungus for Ceylon, and it has not, apparently, been found before outside the United States and Tanganyika [ibid., xii, p. 552]. It is recommended that no seed from diseased crops should be sown, that rotation should be practised in fields that have borne an affected crop and no maize planted for at least one year, and that after harvest the infected cobs should be burnt, while the stalks should be burnt *in situ* or used to make compost. Further outbreaks are to be reported to the Plant Pathologist.

Hoppe (P. E.). **Scolecospores in Diplodia macrospora.**—*Phytopathology*, xxxiii, 6, p. 528, 1943.

A culture of *Diplodia macrospora* [*R.A.M.*, xxii, p. 301] with abundant scolecospores [cf. ibid., xviii, p. 307] was found in platings of rotted maize kernels from a market sample of the 1942 crop from Wye Mills, Maryland. Scolecospores have not before been reported in *D. macrospora*, and this is also the first record of the fungus from Maryland.

Johann (Helen). **Phoma terrestris in the roots of mature Maize plants.**—*Phytopathology*, xxxiii, 6, pp. 526–528, 1 fig., 1943.

In the autumns of 1941 and 1942, *Phoma terrestris* was isolated from pink roots of mature yellow dent maize plants growing in the field at Madison, Wisconsin; the fungus was found alone, and in combination with *Fusarium moniliforme* [*Gibberella fujikuroi*], *Pythium* sp., and miscellaneous fungi. The rose-coloured hyphae and olive-brown pycnidial primordia characteristic of *P. terrestris* were visible in the root tissues. The slender, pink hyphae had penetrated the stele and the pycnidial primordia were most commonly noted in the cortical layers, within the cells of the endodermis, and in the small rootlets. The rose colour of the hyphae remained unaltered during killing, dehydration, and embedding. The fungus was isolated from the plants of several single crosses, among which there seemed to be some differences in susceptibility to the root injury.

Leukel (R. W.), Melchers (L. E.), & Swanson (A. F.). **Weak neck in Sorghum.**—*J. Amer. Soc. Agron.*, xxxv, 2, pp. 163–165, 1943.

The results of five years' laboratory, greenhouse, and field observations on 'weak neck' of sorghum [*R.A.M.*, xx, p. 529], furnish no evidence of a pathogenic origin of the condition, which is one of over-maturity, accompanied by weakness of the rachids and peduncles, especially of the primary culm in certain varieties, e.g., Colby. The sheath surrounding the base of the peduncle is usually filled with a slimy liquid containing various micro-organisms, including *Fusarium moniliforme* [*Gibberella fujikuroi*], *Helminthosporium* spp., and *Alternaria* spp., which subsequently invade the tissues and aggravate the final stages of the disease.

The remedy for this largely varietal trouble appears to lie in the development of strains ripening more in the manner of sorgo and kafir than in that of milo, and a measure of success has already been achieved in the selection of Westlane and Kalo H C 617. Another hopeful possibility consists in the breeding of strains with more strengthening tissue to support the head after the peduncle is dry, the present practice of combine harvesting involving delay until cold weather has shrivelled the culms sufficiently for safe storage.

Wei (C. T.). **Storage diseases of Sweet Oranges in Szechuan.**—*Nanking J.*, ix, pp. 239–268, 1940.

The symptoms and morphology of the causal organisms of the storage diseases of sweet oranges from Chintang, Chiangtsin, and Nanchung in 1938, 1939, and 1940 are described. The most serious disease in Chintang and Chiangtsin was stem-end rot caused by *Phomopsis* [*Diaporthe*] *citri*. In Nanchung, blue mould (*Penicillium italicum*) was most destructive. A form of this fungus, differing from the type in its white colonies, is proposed as a new variety, *P. italicum* var. *album* Wei. In the warmer months of April and May, black rots caused by *Phoma citricarpa* and *Alternaria citri* are common in fruits from Chintang, and stem-end rot (*Diplodia natalensis*) and *Fusarium* rotting prevalent in Nanchung. The author finds that the symptoms and spore size of *P. citricarpa* var. *mihan* Hara are variable factors dependent on the mode of infection and the nutrient media, respectively, and reduces the variety to synonymy with the type. Other fungi causing rots of minor importance are *Penicillium digitatum*, *P. fructigenum*, *Phytophthora citrophthora*, *P. parasitica*, *Colletotrichum gloeosporioides*, *Macrophoma kuwatsukaii* Hara, *Trichoderma viride*, *Botrytis cinerea*, and *Phoma citri* Sacc.

Wei (C. T.) & Hu (K. H.). **A preliminary report on the control of storage rots of Sweet Oranges.**—*Nanking J.*, xi, pp. 79–102, 1942.

The most common storage rots of sweet oranges in Szechuan Province are those caused by *Penicillium italicum* and *Phomopsis* [*Diaporthe*] *citri*. Experiments were conducted to determine the value of crude borax, produced in Sikang, and crude sodium carbonate, manufactured in Chiatung from sodium sulphate, in their control. Treatment consisted of washing the fruits in 0·15 per cent. soap solution to remove dirt, draining off the free water, and dipping in the solution for five minutes at 110° F., draining, drying gently, blotting with a cloth, and finally wrapping with paper impregnated with tung oil. The crude borax, which contained 61·98 per cent. borax and 17 per cent. more soluble sodium compounds, was statistically more effective in a 5 per cent. solution than pure borax (13·4 per cent. rotting with the former as compared with 19 per cent. with the latter and 41·9 per cent. in the untreated). Borax-boracic acid mixture (2 : 1) gave a slightly better result than crude borax, 12·2 per cent. rotting being recorded, but the difference was not significant. Pure sodium bicarbonate (3 per cent.) slightly reduced infection, but the crude bicarbonate was of no value. The efficacy of the chemicals is attributed to the formation of a protective layer preventing spore germination, rather than to spore destruction.

Brooks (C.). **Prevention of stem-end rot.**—*Proc. Fla hort. Soc.*, liv, pp. 61–63, 1941; lv, pp. 61–69, 1942. [Abs. in *Chem. Abstr.*, xxxvii, 16, p. 4149, 1943.]

Oranges treated with ethylene [*R.A.M.*, xvi, p. 744] for 42 hours at 82° F. and a relative humidity of 87 to 92 per cent. under continuous ventilation, and then stored at 70° for a fortnight, developed 27 per cent. stem-end rot (*Diplodia*) [*natalensis*] compared with 2·5 per cent. in the controls. Fruit to which borax was applied before the ethylene treatment contracted 2 per cent. stem-end rot in a fortnight, the corresponding figures for the lots treated with borax after ethylene

and with ethylene and no borax being 7 and 14 per cent., respectively. Sodium ortho-phenylphenate (two minutes' immersion followed by immediate washing to prevent peel injury) did not impair the efficacy of the subsequent ethylene treatment, and reduced stem-rot to 3·2 or 2·5 per cent. according to whether it was applied before or after the latter. Concentrations of phenate exceeding 1·2 per cent. caused injury at 100°, and slightly better results were given by a 2 per cent. solution at 80°. Raising the temperature with a given concentration increased damage to the fruit more rapidly than disease control.

Deschiens (R.) & Lamy (L.). **Sur les facteurs déterminant l'apparition des pièges chez les Hyphomycètes prédateurs de nématodes.** [On the factors governing the development of the 'garrotting' apparatus in the Hyphomycetes preying on nematodes.] *C.R. Acad. Sci., Paris*, ccxv, 19, pp. 450–452, 1942.

Dactylella bembicodes, one of the group of nematode-destroying Hyphomycetes [*R.A.M.*, xxii, p. 306], was stimulated to the more or less abundant production of the 'garrotting' apparatus by the addition to agar cultures at 20° to 25° C. of filtered aqueous extracts of animal origin, including guinea-pig serum and various internal organs (1 in 10 and 1 in 100), and snail (*Helix pomatia*) at 1 in 10, the period required being five days. The stimulatory substances, the nature of which is still under investigation, are thermostable, withstanding over 1½ hours' exposure to a temperature of 120°, and do not succumb completely to the action either of ethyl or methyl alcohol. No comparable effect was exercised by the various plant extracts tested.

Drechsler (C.). **A new non-helicoid bisporous Helicocephalum parasitizing nematode eggs.** *Mycologia*, xxxv, 2, pp. 134–141, 1 fig., 1943.

Latin and English diagnoses, supplemented by a full account of the morphology of the fungus, are given of *Helicocephalum diplosporum* n.sp., found destroying and consuming nematode eggs in decaying leaves of *Poa pratensis* in Virginia. On encountering a nematode egg, a hypha produces an appressorium in contact with it. This perforates the egg integument and intrudes a haustorium composed of flexuous assimilative filaments.

Ullyett (G. C.) & Schonken (D. B.). **A fungus disease of Plutella maculipennis Curt. in South Africa, with notes on the use of entomogenous fungi in insect control.** *Sci. Bull. S. Afr. Dep. Agric.* 218, 24 pp., 5 figs., 3 graphs, 1940. [Received March, 1943.]

The larvae of *Plutella maculipennis* Curt. in South Africa are subject to infection by *Entomophthora sphaerosperma* [*R.A.M.*, xviii, p. 150], the hyphae of which penetrate the integument and enter the body cavity, the preliminary dissolution of the chitinous layer of the cuticle being effected by means of an enzymatic secretion. Reproductive organs are formed only after the death of the host, the propagation of the fungus taking place both asexually and sexually. In the former case it is secured by (*a*) the free conidia borne on aerial hyphae emerging from the insect's body, and (*b*) the thick-walled resting spores (azygospores) produced from short hyphal segments within the larva; in the latter, by the thick-walled zygospores. At this stage the mycelium has entirely disappeared, and the spores constitute the sole remains of the fungus within the mummified larva. The conidia are abstricted at maturity and come to rest on the cabbage leaf surface immediately surrounding the dead larva. Germination proceeds rapidly in the presence of sufficient moisture, the primary conidia giving rise to secondary ones which may in turn produce a tertiary crop. During a wet summer the life-cycle of *E. sphaerosperma* may be completed in three days from the initial penetration

of the host, so that the decimation of whole populations of the latter, familiar under optimum conditions for the parasite, is readily intelligible.

E. sphaerosperma was successfully grown from mycelium on a semi-liquid glucose-gelatine medium with a trace of peptone, and in inoculation experiments the conidia were applied with a wet brush to the body of the larva. Adult insects were much more susceptible than young ones, the change in reaction with advancing age being tentatively attributed to the elimination from the blood stream of some factor or factors antagonistic to the pathogen in the juvenile larvae.

The results of a statistical and theoretical study of the interrelationships between *E. sphaerosperma*, *P. maculipennis*, and the insect parasite of the latter (a species of *Angitia*) indicated that the fungus, while introducing a factor exerting a temporarily lethal effect on its host, ultimately disturbs the existing equilibrium by destroying the predator, either directly by preventing it from reaching maturity on infested insects or indirectly by reducing the numbers of available hosts. The predator normally acts as a constant check to the expansion of the cabbage pest and the resultant increase in the average density of *P. maculipennis* at the expense of its parasite resulted in serious economic damage to the crop. Such being the case, the application of *E. sphaerosperma* to the control of *P. maculipennis* can only be regarded, at any rate under Transvaal conditions, in the light of a temporary measure for use in special circumstances and not as part of the normal campaign of extermination.

Lloyd (F. E.). **The carnivorous plants.**—xv+352 pp., 38 pl., 12 figs., Waltham, Mass., U.S.A., The Chronica Botanica Company, 1942. $6.

This work includes (pp. 169–176) a chapter on carnivorous fungi, which deals with their occurrence, habit, glands, secretion, and digestion, and to which a list of 39 references is appended. Many of these are to papers by C. Drechsler, which have been noticed from time to time in this *Review*.

Johansen (Gudrun). **Hørsygdomme.** [Flax diseases.]—*Nord. JordbrForskn.*, xxiv, 1–2, pp. 34–49, 4 figs., 1942.

The three principal seed-borne diseases of flax in Denmark are those caused by *Sphaerella linorum*, *Colletotrichum lini* [*C. linicola*], and *Polyspora lini*, the first records of which for the country date from 1940, 1939, and 1937, respectively. The symptomatology, life-history, and mode of infection of all three pathogens are described. From 1940 to 1942 samples of seed intended for propagation were inspected for the presence of *C. linicola* and *P. lini*, 100 seeds from each batch being cultured on potato dextrose agar: the average incidence of the two fungi in the three years was 8 and 3, 4 and 0·4, and 3 and 0·5 per cent., respectively. The amount of infection, based on a scale of 0 to 5, by *P. lini* in fields sown with healthy, slightly (1 to 3 per cent.), and heavily infested (17 to 18 per cent.) seed was 0·11, 0·67, and 1·90, respectively. As was to be expected, the incidence of seed infection rose with the degree of stem infestation in 40 samples examined, the percentage of *P. lini* in seed from stems with index figures for infection of 0, 0·1 to 0·4, 0·5 to 1, and over 1 being 0·3, 6·1, 19·4, and 50·7, respectively, while the corresponding figures for *C. linicola* were 0·2, 0·6, 0·6, and 2 per cent., respectively. In an experiment to determine the cumulative effect of *P. lini* on its host, the Stormont Cirrus and Stormont Gossamer varieties were grown for periods of one to five years on a farm at Lyngby. At the second inspection on 16th August, 1940, the percentages of stem infection on Cirrus in the one-, two-, three-, four-, and five-year plots were 84, 90·1, 96·5, 95·1, and 98·2, respectively, the corresponding figures for Gossamer being 75·9, 94·4, 92·5, 94, and 96·4, respectively. Inoculation experiments with monospore cultures of *C. linicola*, *S. linorum*, and *P. lini* on flax seedlings resulted in 100, 70, and 48 per cent. infection, respectively.

An account is further given of the ubiquitous rust *Melampsora lini*, which is not seed-borne. *Fusarium lini* is unlikely to cause severe damage in Denmark, where the high temperatures essential to its active spread do not occur. *Phoma*, *Pythium*, *Rhizoctonia*, and other *F.* spp. are all concerned in the damage sustained by flax in the early stages of growth, while among its facultative parasites may be mentioned *Alternaria*, *Macrosporium*, and *Cladosporium* spp.

At the beginning of July, 1940, flax plants exhibiting the typical symptoms of grey speck (manganese deficiency) were submitted for inspection from various parts of the country. Soil analyses having revealed a low manganese index in three of the affected fields, the element was supplied (in the form of sulphate) at a dose of 50 kg. per ha. with completely successful results.

Stapel (C.). **Afsvampning af Hørfrø.** [Flax seed disinfection.]—*Nord. Jordbr-Forskn.*, xxiv, 1–2, pp. 50–59, 1942.

Particulars are given of experiments carried out in Denmark on the control of seed-borne diseases of flax [see preceding abstract] by dusting with mercury-containing preparations. In 1940 a batch of seed fairly heavily infected by *Colletotrichum lini* [*C. linicola*] was treated with one of these dusts at the rate of 200 gm. per 100 kg., a small amount of steam being used to bind the fungicide to the seed, which was sown on 24th May. The initial check to germination observed a week after sowing was overcome during the next week, when the ratio of emergence of untreated to dusted seed was 100 : 123; at the same time the incidence of primary infection on the cotyledonary leaves of the controls was 12·2 per cent. compared with complete freedom from attack on those of the disinfected material.

Two lots of seed infected by *Polyspora lini*, one heavily and the other lightly, were also treated with two dusts (200 gm.), A and B, with paraffin oil (500 gm. per 100 kg. seed) as a 'binder'. The treatment, while retarding the rate of germination, did not impair the absolute germinative capacity of the seed. As regards the control of light primary infection, the final counts on 11th June (sowing date 7th May) were 23·6, 6·1, and 9·1 per cent. for the untreated plots and those dusted with A and B, respectively, the corresponding figures for heavy attack being 60·6, 30·9, and 30·3, respectively. Secondary infection was less effectively combated, 95 to 99 per cent. of the straw of both treated and untreated plots being diseased, although the quality of the former was definitely superior to that of the latter and 39 per cent. more was available for scutching. The increase in the seed and straw yields ranged from 4 to 6 per cent.

The most troublesome disease of linseed is that caused by *Septoria linicola* [*Sphaerella linorum*], preliminary tests on the control of which with a few hundred grammes of a mercury dust in 1941 gave encouraging results. Steam is an effective 'binder' of the fungicide to the seed, but its use requires great care owing to the difficulty of securing a uniform rate of application; the irregularities attendant on errors in dosage may be responsible for severe set-backs to germination in the field.

An experiment in linseed treatment in 1940 resulted in an increased seed yield of 17 per cent. in the lots dusted with tillantin 1875 at the rate of 200 gm. per 100 kg., which also raised germinative capacity to 132 (taking 100 as the index for the controls), the corresponding figures for the 100 and 400 gm. doses being 122 and 158, respectively.

A number of tests were carried out in which larger doses of the dusts (800 and 1,600 gm. per 100 kg.) were applied for the control of *P. lini* and *S. linorum*. The fungicidal action of the plant-protectives rose as the quantities were increased, but a very adverse influence was exerted on germination and growth. Such treatments would obviously be impracticable for commercial purposes, but might be appropriate for the disinfection of valuable material for use as progenitors in breeding.

Brierley (P.) & McWhorter (F. P.). **Diseases of garden Lilies.**—*Gdnrs' Chron. Amer.*, xlvii, 7, pp. 176–177, 184, 3 figs., 1943.

A short, popular account is given of the symptoms, cause, and control of lily blight (*Botrytis*) [*elliptica*: *R.A.M.*, xv, p. 507; xx, p. 19], *Fusarium* bulb rot [ibid., xv, p. 507], and mosaic [ibid., xx, p. 207]. According to E. P. Imle (American Lily Yearb., pp. 30–41, 1942), *Lilium hansoni*, *L. sargentiae*, and *L. maximowiczii* are highly resistant to *Fusarium* bulb rot. The authors state that *L. hansoni* and *L. pardalinum* are resistant to mosaic.

Hawker (Lilian E.). **Experiments on the rate of spread of Narcissus stripe in the field.**—*Ann. appl. Biol.*, xxx, 2, pp. 184–185, 1943.

In preliminary tests initiated by P. H. Gregory at Slough, in which rows of *Narcissus* plants with symptoms of stripe disease [*R.A.M.*, xxii, p. 359] were alternated with rows of healthy ones, no spread of disease was observed after five years. In the author's own experiments, commenced in 1933 at Slough, six lots of striped bulbs were planted in rows alternating with those of sound bulbs, the distance between rows being 12 in. and between adjacent bulbs in the same row 6 in. Of these six lots, five showed no spread of the disease in the fifth season after planting. Four of these showed a slight spread, from row to row and within the same row, during the following three years, the transmission taking place, with one exception, within the same row. It is suggested that this spread may have been due to the entanglement of roots of healthy and diseased plants. The sixth lot of plants had been moved to a fresh plot at the end of the first growing season, and this lot showed an increase in the number of diseased plants the following year, suggesting, as in McWhorter's experiment [ibid., xi, p. 579], that infection might have spread through roots damaged in lifting. In two tests where the distance between rows was 9 or 6 in. and that between adjacent plants 4 in., some spread, both from row to row and within a row, occurred during the first five years, particularly in the lot with the closest spacing. The control bulbs planted at some distance from diseased ones all remained free from infection. In an experiment with a few severely infected bulbs interplanted with sound stocks, disease spread from diseased to sound plants, while the sound stocks planted at a distance as controls remained unaffected. The results of these tests indicate that root transmission takes place when diseased and healthy plants are inter-planted. The amount of spread appears to be correlated with the distance between diseased and healthy bulbs. The small amount of infection of plants near to diseased ones does not, in the author's view, suggest transmission by insects above ground, but transmission may possibly take place through roots or bulbs damaged by insects in the soil, particularly where roots of diseased and healthy plants are closely interwoven.

Olive (L. S.). **Morphology, cytology, and parasitism of Thekopsora hydrangeae.**—*J. Elisha Mitchell sci. Soc.*, lix, 1, pp. 45–67, 8 pl., 1943.

Thekopsora hydrangeae is stated to occur abundantly in the mountains of North Carolina on *Tsuga canadensis* and, in its uredo and teleuto phases, on *Hydrangea arborescens*, *H. radiata*, and *H. cinerea*. *Thekopsora vacciniorum* was found sparingly on *Tsuga canadensis*; its alternate hosts were *Azalea viscosa* var. *montana*, *A. arborescens*, *A. calendulacea*, and *Cyanococcus similatus*, the last three being reported for the first time among the hosts of this rust. *Melampsora abieti-canadensis* occurred frequently on twigs and leaves of *T. canadensis*.

The first external sign of *Thekopsora hydrangeae* on *Tsuga canadensis* is the appearance of numerous inconspicuous, small pycnidia on the under and, to a lesser degree, upper surface of leaves, oozing out a sticky secretion containing the pycnospores. Aecidia appear as yellow, dome-shaped protrusions on the lower

surface of the leaf; the long, delicate peridia are quite conspicuous. Uredosori appear later in the season as numerous small, bright orange-coloured spots on the lower surface of *Hydrangea* leaves, uredospores continuing to re-infect the plant until the latter part of October. The teleutosori are quite inconspicuous; teleutospores overwinter on fallen *Hydrangea* leaves, and in the spring, when the leaves are moistened, basidia appear abundantly. Characteristic of this rust are the numerous subcuticular hyphae. Haustoria in the leaves of *Tsuga canadensis* are elongate and lobed uninucleate structures with an affinity for starch grains.

Slatensek (J. M.) & Hollowell (E. A.). **Growth relationships as affecting root rotting and premature death of Sweet Clover.** *J. Amer. Soc. Agron.*, xxxv, 6, pp. 523–531, 3 figs., 1 graph, 1943.

A severe root and crown rot, occurring each year since 1938 in the breeding nurseries for sweet clover (*Melilotus suaveolens*, *M. alba*, and *M. officinalis*) at the Nebraska Agricultural Experiment Station and causing an annual mortality among second-year plants of 60 per cent., was found to be due to excessive first-year growth. The restriction of such luxuriant development by means of close spacing, late sowing, and removal of top growth to reduce the photosynthetic area resulted in freedom from the disease, which assumed a virulent character, on the other hand, in widely spaced plants allowed to reach a size corresponding to that of regular nursery-grown plants. In 1941–2 a completely healthy second-year nursery was secured by starting the widely spaced (3 by 3 ft.) plants in late spring and transplanting in late June and early July. The aerial symptoms of the root rot appear mainly in the spring of the second year of growth and consist of partial or total wilting and yellowing, usually followed by death. The diseased roots are overgrown, soft, containing necrotic areas of varying extent, and consist of more and larger cells than those of healthy plants, the cell walls of the former being also abnormally thin.

Jones (F. R.). **Growth and decay of the transient (noncambial) roots of Alfalfa.**—*J. Amer. Soc. Agron.*, xxxv, 7, pp. 625–634, 1 fig., 1 diag., 1943.

Lucerne rootlets at the Wisconsin Agricultural Experiment Station have been observed to die off during the summer, following a browning and shrinkage of the primary cortex, in which the mycorrhizal fungus previously described [*R.A.M.*, iv, p. 301] may or may not be present, accompanied by a soft decay of the ends of the rootlets. The pathogenicity of the species of *Fusarium* isolated from such material has not yet been determined. The process of deterioration begins in late May or early June and increases rapidly from the middle to the end of the latter month. In severe cases the development of rootlets in July and August appears to be largely inhibited by the rotting of the ends almost immediately on emergence, and it seems possible that the early decay of transient roots limits to some extent the growth of the second crop.

Weihing (R. M.) & Robertson (D. W.). **The comparative performance of Alfalfa varieties in nursery and field plots in irrigated soil infected with Phytomonas insidiosa.**—*J. Amer. Soc. Agron.*, xxxv, 2, pp. 125–136, 1943.

As a result of the tests reported in full in this paper, the authors recommend for forecasting yield and other agronomic properties of lucerne, grown under irrigation in soil infested with *Phytomonas insidiosa* [*Corynebacterium insidiosum*] in Colorado, five-row plots with rows 12 in. apart and 20 in. alleys, the middle or the three central rows only being rated.

Sprague (R.). **The status of Septoria alopecuri and some related species.**—*Mycologia*, xxxv, 3, pp. 259–263, 1 fig., 1943.

Discussing the status of *Septoria alopecuri* (Karst.) Sydow, originally listed by

Karsten (1884) as *S. bromi* var. *alopecuri* on *Alopecurus pratensis* from Finland, the author states that no type material is available but suggests that Karsten's fungus was more likely an undeveloped *Hendersonia*. Sydow's specimen is close to *H. crastophila* but it has narrower spores than most collections of the species.

A collection of *S. andropogonis* on living leaves of *Andropogon furcatus* from Kansas is described as a new form of this species, f. *sporobolicola*. It differs from the species in having larger pycnidia and smaller, more or less circular, non-striate lesions.

A fungus on living leaves of *Muhlenbergia mexicana* from Minnesota is described as *S. mississippiensis* n.sp. It is possibly close to Karsten's fungus, but not to *H. crastophila*.

Hardison (J. R.) & Sprague (R.). **A leaf spot of grasses caused by a new species of Phleospora.**—*Mycologia*, xxxv, 2, pp. 185–188, 2 figs., 1943.

Latin and English descriptions are given of *Phleospora graminearum* Sprague & Hardison n.sp., found in Michigan in 1941, causing a leaf spot of *Agropyron repens* and *Elymus canadensis*. Infection was very light on the latter, and was confined to the leaf blades, whereas on the former host it was heavy on the leaf blades and in some cases affected the leaf sheaths.

The fungus, which produced variable, elongate, brown spots paler in the centre, with margins sometimes yellow or buff-coloured, is characterized by subgregarious pycnidia, at first immersed, non-ostiolate, brown, later erumpent, prominent, with a small ostiole, subglobose, 90 to 160 μ in diameter, and pale brown; the upper layer breaks away, and the context is translucent and golden; the blunt, short, hyaline pycnophores are 3 to 5 μ wide, and the yellow-hyaline, obclavate, 1- to 6-septate pycnospores taper to a blunt point, are rounded or blunt at the base, variable, and measure 30 to 55 by 3·3 to 5·6 μ.

Struble (F. B.). **Plot technique for disease-control studies on fine turf.**—*Phytopathology*, xxxiii, 6, pp. 528–530, 1 fig., 1943.

After pointing out that investigations on the chemical control of fine turf diseases on golf courses are hampered by the difficulty of finding sufficient area to minimize the error introduced by apportioning the small amount of necessary chemicals, the author describes a technique which obviates this difficulty. An area of 1,000 sq. ft. is allowed for each treatment and the required area for all the treatments marked out. The individual plots for the separate treatments are similarly marked off, and treatment is applied to both the rough and the green. For dollar spot [*Sclerotinia homoeocarpa*: *R.A.M.*, xvi, p. 681] data are obtained by arbitrarily selecting specific stations on a diagonal of each plot. The area of each station is that of a wire hoop 3 ft. in diameter and the spots per station are counted and averaged. For large brown patch [*Rhizoctonia* spp., chiefly *Corticium solani*: ibid., xvi, p. 468] and the 'melting-out' complex [*Helminthosporium* and *Colletotrichum* spp.] a rating system should be arranged, using the number of patches per ft. of diagonal.

Langdon (R. F.). **Ergot of native grasses in Queensland.**—*Proc. roy. Soc. Qd*, liv, 3, pp. 23–32, 1942.

For the reliable determination of species of *Claviceps* the observation of the stromata produced by sclerotial germination is essential. In laboratory experiments with the sclerotia of six hosts of *C. pusilla* in Queensland [*R.A.M.*, xxi, p. 82], the same sequence of stages in the development of the stromata was found to occur constantly, and a comparable degree of uniformity characterizes other species of the genus, so that the mode of sclerotial germination may be used with advantage, in conjunction with the appearance of the stromata, in the diagnosis of *C.* spp. The most consistent features of the stromata in these studies were the

colour of the stipes and capitula, the presence or absence of loose hyphae, and perithecial size and shape; ascus length, on the other hand, varied within fairly wide limits. Conidial characters may be of use in the identification of species already described. A determination made on the basis of conidial and sclerotial morphology affords a valuable guide in the planning of inoculation experiments in which known ergot species are to be used as inoculum for a host bearing an ergot requiring determination, since positive results following infection with a given species would leave little doubt as to the identity of the fungus on the new host. This method was, in fact, of great service in a series of inoculation experiments with *C. pusilla*, the host range of which was found to comprise 12 indigenous grasses. This species of ergot is distributed throughout south-eastern Queensland, and was further identified on a sample of *Bothriochloa* sp. from New South Wales. The ascus length in the Queensland material of *C. pusilla* examined was found considerably to exceed Cesati's figure of 56 μ, which it is suggested should be replaced by a range of 55–160 μ.

Technical diagnoses are given of four new *C.* spp. collected in various parts of Queensland during 1941, namely, *C. annulata* on *Eulalia fulva*, *C. platytricha* on *Ischaemum australe*, *C. hirtella* on *Eriochloa pseudoacrotricha*, and *C. glabra* on *Digitaria longiflora*. The taxonomic positions of *C. paspali* on *Paspalum orbiculare* and of the ergots on *Hyparrhenia filipendula* and *Paspalidium* spp. are discussed.

Phillips (W. R.) & Johnston (F. B.). **The effect of boron applications on the subsequent storage and physiological behaviour of McIntosh Apples.**—*Sci. Agric.*, xxiii, 8, pp. 451–460, 4 graphs, 1943.

In studies on the effect of boron applications on the storage and physiological behaviour of McIntosh apples [*R.A.M.*, xxii, p. 362], observations before harvest showed that the treated plots appeared less mature than the untreated, but maturity data indicated that the treatments did not greatly reduce maturity progress. The results showed that the boron applications greatly increased core flush, or, conversely, the absence of boron resulted in core flush reduction. Where core flush was present, increasing the storage temperature to 39° F. significantly reduced it. The corky core indices were not consistently influenced by storage temperature. There was a close correlation between amounts of boron and core flush, and a converse relationship between core flush and corky core totals.

In 1939, fruit was harvested from the boron plots on 16th September and about a week later. At the first picking, all the samples were immature. At the second, there was marked advance in ground colour and starch reduction, no great difference being noted between the controls and treated plots. All the samples were stored at 32°, and re-examined on 26th February. The second picking was then of much better quality than the first. The controls were better than the treated apples in both pickings. The core-flush index in the controls was reduced from 21·1 to 3·9 between the two pickings, and in the treated plots from 81·3 to 58·4.

The mean corky core indices for the apples from the boron-treated plots were 66·1, and 61·5 for the first and second pickings, respectively, while the fruit from the plots with no corky core (which would possibly be higher in boron content) showed core flush indices from 111·6 and 52 for the first and second pickings, respectively.

From a practical point of view, the most important conclusion is that boron applications delay the maturing of McIntosh apples. Retarding picking from treated trees would appreciably assist in controlling core flush in storage.

Boynton (D.). **Magnesium deficiency—a newly recognized orchard trouble.**—*Fm Res.*, ix. 2, p. 2, 1943. [Abs. in *Chem. Abstr.*, xxxvii, 13, p. 3870. 1943.]

The application to the soil surface of large quantities of magnesium sulphate in

the form of the German product, Emjeo, and as Epsom salts, gave partial control of leaf blotch associated with magnesium deficiency in mature McIntosh apple trees after three years, the effect of the compound being somewhat improved by an admixture of calcium hydroxide. Injections of dilute solutions of Epsom salts into the wood of affected branches controlled the disease during the season of application, but the beneficial effects did not persist, and small overdoses tended to cause fairly severe damage to the leaves. The symptoms of magnesium deficiency did not develop on the foliage of moderately affected trees sprayed four times during the summer with a solution of Epsom salts.

Hockey (J. F.). **Mosaic, false sting, and flat limb of Apple.**—*Sci. Agric.*, xxiii, 11, pp. 633–646, 11 figs., 1943.

A study of mosaic, false sting, and flat limb diseases of apple [*R.A.M.*, xx, p. 264] was conducted in Nova Scotia during 1937. Mosaic, which is stated to cause a very conspicuous, irregular, light yellowish to cream mottling of the foliage, followed later in the season by a necrosis of the light areas and thus a partial defoliation of the trees, was experimentally transmitted by grafting, but not by expressed juice or aphids. Limited data indicated a slight reduction in yield from affected trees.

The symptoms of false sting, believed to be a virus disease, are restricted to fruits, on which there appear depressed areas, sometimes with slight cracks and russeted streaks in the depressions; in the more pointed varieties, the calyx end may be gnarled and misshapen. The affected fruits show, under the microscope, a distorted vascular pattern. The only known method of transmission of this disease is by grafting. Eradication and careful selection of grafting material are recommended as control measures for both mosaic and false sting.

Flat limb is characterized by a flattening of the wood of the branches; this becomes very pronounced as the branches get older and is followed by a twisting and deformation of the branch. It occurs mainly on Gravenstein, but a very similar condition has been observed on Wagener. All available evidence indicates a stock-scion incompatibility as the initial cause of this condition.

Britton (J. E.), Fisher (D. V.), & Palmer (R. C.). **The influence of some horticultural practices on bitter pit in Okanagan-grown Apples.**—*Sci. Agric.*, xxiii, 11, pp. 651–675, 6 figs., 1943.

Bitter pit of apples [*R.A.M.*, xxii, p. 255] is stated to have been causing severe losses in British Columbia over a period of several years; exceptionally heavy losses are reported from the southern Okanagan valley in 1937. Replies to a questionnaire from 14 districts showed that bitter pit attacks many varieties, but particularly high losses are caused in Cox's Orange, Northern Spy, and Newtown. Losses incurred by the first two varieties amount to 55 per cent. in some orchards, while Newtown, though attacked less severely in individual orchards than the other two, suffers comparatively great total losses, being planted very extensively.

Experiments were conducted with Cox's Orange and Northern Spy apples over a two-year period, 1938-9, and with Newtown over one of five years, 1938–42, involving altogether 1,000 bush. boxes of apples from over 100 trees located in ten different orchards. It was found that fruit from trees carrying less than a third of a normal full crop is much more susceptible to bitter pit than fruit from trees carrying more than a third. Losses from bitter pit were materially reduced, but not entirely prevented, by packing the fruit at the proper stage of maturity, as indicated by maturity tests. Prompt storage at 32° F. delayed and to some extent reduced the development of bitter pit.

Careful comparison made of weather conditions which prevailed at the Summerland Experimental Station from 1939 to 1942, revealed that during the first

two years, when bitter pit was severe in Newtown apples, there was more than the average amount of sunshine in August and September and for the period April to October, inclusive, while in the following two years, in which bitter pit was slight, sunshine for the same period was significantly below average. Furthermore, rainfall during the growing season was markedly lower in the first two years. On the other hand, weather conditions in 1941 were very different from those in 1942 indicating the complexity of the problem. It is suggested that accurate records over a longer period of years need to be made before the connexion between bitter pit and weather could be assessed. With regard to control, it appears desirable to segregate the fruit from light and heavy crop trees. Grading for size or colour at the packing stage does not, in the authors' opinion, guarantee a complete segregation, which is better carried out in the orchard at harvesting time, by picking fruit from trees carrying less than a third of a normal crop separately from the main tonnage.

Butler (C. G.), Finney (D. J.), & Schiele (P.). **Experiments on the poisoning of Honeybees by insecticidal and fungicidal sprays used in orchards.** *Ann. appl. Biol.*, xxx, 2, pp. 143–150, 2 diags., 1943.

Since the introduction of extensive spraying of fruit trees, complaints of losses of honey-bees from spray poisoning are stated to have been increasingly frequent [*R.A.M.*, xxii, p. 140]. No cases of poisoning by orchard sprays other than by those containing arsenic, in the form of calcium or lead arsenate, have been reported. Preliminary laboratory tests indicated that of the common constituents of spray mixtures, only lead arsenate and flowers of sulphur were likely to cause severe poisoning. The results of experiments conducted during 1940 to 1942 showed, however, that provided bees have alternative sources of water, pollen, and nectar, the addition to spray mixtures of 1 per cent. or stronger lime-sulphur or 0·05 per cent. or stronger nicotine sulphate is sufficient to repel the great majority of bees from sprayed trees and thus to reduce the risk of arsenical poisoning. When open flowers of apple trees were sprayed with various sprays in the orchard, counts of bees showed that the above-mentioned two substances had retained their repellent value for at least seven days.

Burkholder (C. L.). **Plum spraying problems.**— *Hoosier Hort.*, xxv, 4, pp. 52–54, 1943.

In connexion with recommendations for certain necessary adjustments in the spraying schedule for plums in abnormally wet seasons, such as 1942, in Indiana, some notes are given on varietal reaction to brown rot [*Sclerotinia fructicola*]. The damson group, especially French and Shropshire, rarely need more than two lime-sulphur sprays during July and August to protect them against infection, very little of which will occur in dry seasons even without treatment. Other varieties resistant to brown rot are Fellenburg or Italian Prune (which is, however, very susceptible to leaf spot), Diamond, and Stanley. On the other hand, *S. fructicola* occurs in a highly virulent form on Lombard, Burbank, Imperial Epineuse, Gulii, Monarch, Austrian and Hungarian Prune, Yellow Egg, Grand Duke, Reine Claude, and Albion, the three last-named late-ripening varieties requiring a supplementary sulphur spray in September. The same three varieties are very resistant to leaf spot.

Simonds (A. O.) & Bodine (E. W.). **A macrochemical reaction for the detection of Peach mosaic.**— *Science*, N.S., xcvii, 2530, pp. 587–588, 1943.

In experiments with the Elberta peach variety in Colorado, the colour reactions obtained with the xylem of sections of roots and stems of trees infected with the severe and medium strains of the peach mosaic virus [*R.A.M.*, xxi, p. 338] ranged from Ridgway's maize-yellow to apricot-yellow, while healthy sections were

Persian lilac and daphne pink. The technique employed consisted in cutting thin, free-hand sections from diseased and healthy trees, placing first a drop of a saturated solution of phloroglucinol in 100 per cent. methyl alcohol on each section, and then, when that had evaporated, a drop of a solution of nitrophenolic acid, which in turn was allowed to evaporate. The solution of nitrophenolic acid was prepared by adding 50 ml. concentrated nitric acid to ½ gm. of C.P. phenol, leaving it to stand over-night; then mixing this with an equal volume of water the next day and again leaving it to stand for about 18 hours; and finally placing three drops of this solution in 25 ml. 100 per cent. methyl alcohol. The colour reactions were greatest on fresh material tested in the autumn or early spring.

Wilson (E. E.). **Tests of eradicant sprays for use against Sclerotinia laxa and Coryneum beijerinckii in Apricots and Almonds.**—*Phytopathology*, xxxiii, 6, pp. 506–516, 1 fig., 1 graph, 1943.

Of 41 materials tested for their ability to eradicate *Sclerotinia laxa* overwintering in blighted twigs and rotted fruits in apricot and almond trees, the only ones that showed promise were 0·5 and 0·3 per cent. solutions of sodium dinitro-ortho-cresylate (elgetol) and 1 per cent. solutions of sodium tetrachlorophenate, sodium pentachlorophenate, sodium ortho-phenolphenate, tetrachloropara-benzoquinone [spergon], and 4-chloro-1,2-benzoquinone dioxime. In extended trials, these materials displayed only moderate ability to prevent the development of the sporodochia on the twigs during winter, mainly because they failed to kill the mycelium within the twigs. After the sporodochia had developed, however, these materials were, under some conditions, moderately effective in destroying them. In orchard tests in 1942, no material reduced the primary inoculum sufficiently to lower the amount of blossom infection to any appreciable extent.

The sodium salts of dinitro-ortho-cresol and the two chlorophenols were about equally effective in killing the conidia of *Coryneum beijerinckii* [*Clasterosporium carpophilum*] in blighted dormant buds of apricot, peach, and almond. One week after applying 0·5 or 1 per cent. solutions of these materials to affected twigs, 80 to 95 per cent. of the conidia were dead. Many new conidia were, however, subsequently produced within the sprayed buds.

Unless these materials can be made more capable of penetrating the conidial masses and of entering the host tissues they are unlikely to prove successful as eradicant sprays against these two diseases.

Keitt (G. W.) & Clayton (C. N.). **A destructive virus disease of sour Cherry.**—*Phytopathology*, xxxiii, 6, pp. 449–468, 9 figs., 1943.

Studies carried out in Wisconsin from 1936 to 1940 on yellows of sour cherries [*R.A.M.*, xxii, p. 214] showed that affected trees tend to produce large leaves, some of which bear conspicuous chlorotic areas. The chlorotic leaves, together with some that remain green, are abscissed, severe defoliation generally occurring three or four weeks after petal-fall. The diseased trees seem to live almost as long as healthy ones, but they produce scanty crops.

Reciprocal budding experiments between affected and healthy trees resulted in transmission of the condition in every case in which union of tissues of bud piece and budded tree occurred. Transmission of the virus was also effected by budding from *Prunus cerasus* to *P. mahaleb* and back.

Records of incidence from 1936 to 1940, inclusive, in five orchards containing 2,593 trees, showed an average annual increase of 3 per cent. In 1940, the percentage of diseased trees in 18 orchards containing 6,588 trees was 10·7. Montmorency and Early Richmond appeared equally susceptible.

Preliminary tests strongly suggested that the disease can be transmitted by Cicadellidae. Further work is in progress.

Ulman (P.). **Red stele disease of Strawberry.**—*Hoosier Hort.*, xxv, 4, pp. 51–52, 1943.

The symptoms of red stele disease of strawberry [*Phytophthora fragariae*], recently detected in Indiana [cf. *R.A.M.*, xxii, p. 363], are briefly described and growers are advised to adopt stringent measures for its exclusion from their plantations. Once established in a site, the pathogen will remain viable in the soil for at least five or six years, and in such cases the only solution lies in the cultivation of a resistant variety, such as Pathfinder. Field inspection and the rejection of diseased material for planting are greatly complicated by the absence of any external signs of infection under certain conditions both on dry and wet soils, the period during which a plant may act as a symptomless carrier of the fungus being as yet unknown.

Harris (R. V.). Bryce (A. D.), & Foister (C. E.). **Raspberry leaf curl.**—*Fruit-grower*, xcvi, 2483, p. 51, 1 fig., 1943.

Attention is drawn to the occurrence of serious and widespread outbreaks of leaf curl in Norfolk Giant raspberry plantations in Angus and Perthshire, and growers are advised to adopt the following precautionary measures: (1) immediate removal and burning of every diseased or suspected stool; (2) exclusive use of healthy canes for new plantings of the affected variety; and (3) isolation of Norfolk Giant plantings, especially those intended for cane propagation, from Lloyd George (believed to be a carrier of the disease), particularly in the case of stocks of the latter propagated in Scotland for some years. Leaf curl has not yet been observed on Norfolk Giant in English plantations, even on certain Scottish stocks of the variety.

Bitancourt (A. A.). **Podridões da Castanha do Pará.** [The rots of the Pará Chestnut.] - *Biológico*, vii, 11, pp. 303–312, 1 fig., 1941. [English summary. Received August, 1943.]

Towards the end of 1938 the author received from a commercial firm at Manaos, in the State of Amazonas, Brazil, two consignments of Pará chestnuts (*Bertholletia excelsa*), known to the trade as 'Brazil nuts', the contents of which were divided into three lots (1) being immediately opened, (2) kept for five months in a damp refrigerator at 5° to 6·5° C., and (3) for the same period in a well-ventilated room. During the period covered by the experiments a thermo-hygrograph registered a temperature of 16° to 29° and a humidity of 34 to 88 per cent. in the city of São Paulo.

The three series were found to contain the following percentages of rancid and rotten nuts: (1) 4 and 6, respectively, (2) 6 and 22, and (3) 4 and 5. In lot (1) *Aspergillus flavus* was isolated from over 50 per cent. of the rotten and rancid material under examination, other species represented being *A. luteo-virescens*, *A. wentii*, *A. ochraceus*, *Monilia sitophila* (probably an accidental laboratory contaminant), *Penicillium phoenicum*, *Rhizopus nigricans* [*R. stolonifer*], a species of *Diplodia*, probably *D. natalensis*, with which *Pellionella macrospora* Spencer [*R.A.M.*, i, p. 235] is regarded as identical, a species of *Phomopsis*, assumed to be that referred by Spencer to *P. bertholletianum* [loc. cit.] and falling in the group having *Diaporthe medusae* as its perfect stage, *Colletotrichum gloeosporioides*, and *Cephalosporium bertholletianum* Spencer [loc. cit.]. The organism predominating in series (2) was a species of *Penicillium*, probably *P. citricola*, which also occurred in (3) together with an *Aspergillus* of the *albus* group and *R. stolonifer*. Dr. C. Thom, of the United States Department of Agriculture, undertook the identification of the *Aspergillus* and *Penicillium* spp. in connexion with this inquiry.

It is evident from these results that humidity is the controlling factor in the health of stored Brazil nuts, which keep well in properly ventilated rooms even

at relatively high temperatures. Where ventilation is inadequate to reduce the atmospheric humidity to a suitable level, the installation of a small refrigerator to condense the moisture of the storage rooms is recommended.

Horsfall (J. G.). **A conference on spray material shortage.**—*Chron. bot.*, vii, 7, pp. 338–339, 1943.

An informal conference under the chairmanship of Dr. C. I. Bliss held on 14th February, 1943, at Columbus, Ohio, to discuss the possibilities of effecting economies in spray materials during war-time disclosed the fact that the multidose method enables the experimenter to determine quantitatively how much of a given material can be saved by modifications in technique. The slope of the dosage response relation shows how far dosage can be reduced without serious risk. The evidence so far indicates that reduction in concentration is the most effective means of economizing, reducing control, as it does, less rapidly than does reducing the number of gallons applied per acre. Reduction in the number of applications must also be seriously considered, as it saves labour. It might be useful in vegetable spraying, where time is less important than in fruit spraying.

Wilson (E. E.). **Physical characteristics of Bordeaux mixture in relation to its qualities.**—*Phytopathology*, xxxiii, 6, pp. 497–505, 1 fig., 2 graphs, 1943.

Studies on the weather resistance of Bordeaux mixtures varying in physical characteristics because of differences in the methods of combining the copper sulphate and lime showed that precipitate made by mixing diluted components settled more slowly and was more bulky than that made by mixing concentrated components (12 per cent.) and then diluting.

In three weathering tests on twigs of peach and apricot trees in winter, when rainfall totalled 3 to 4 in. Bordeaux mixture prepared with diluted components lost 18, 34, and 38 per cent. of the copper, while that prepared with concentrated components lost 65, 70, and 58 per cent.

Active and prolonged agitation improved the suspension quality of the concentrated type but did not appreciably affect its weathering quality. In two of three tests the mixture made with diluted constituents deposited significantly more copper than that made with concentrated ingredients.

Goldsworthy (M. C.), Green (E. L.), & Smith (M. A.). **Fungicidal and phytocidal properties of some metal dialkyl dithiocarbamates.**—*J. agric. Res.*, lxvi, 7, pp. 277–291, 1 graph, 1943.

Experiments made to determine the fungicidal and phytocidal properties of some metal dialkyl dithiocarbamates indicated that the dimethyl derivatives possess the greatest fungicidal value, and the dibutyl derivatives the least. The iron, lead, and zinc dimethyl derivatives offered the most promise, as they caused the least plant injury. From all standpoints the lead salts appear best.

Preliminary tests indicated that the iron, zinc, and lead derivatives can be made up in the spray tank by mixing stoichiometrical equivalents of the reacting salts. The product remains in suspension and has superior sticking qualities. Zinc and iron mixtures of this type caused slight injury to peach, but none caused any injury to apple.

All the metal dialkyl dithiocarbamates tested were compatible with hydrated lime and lead arsenate. Tests with the iron dimethyl dithiocarbamates indicated that this metal derivative retained its fungicidal efficiency when combined with bentonite or nicotine sulphate and bentonite, but not when combined with bentonite flocculated with lime.

In field tests against apple scab (*Venturia inaequalis*), a commercial sample of ferric dimethyl dithiocarbamate gave satisfactory results. It controlled peach

scab (*Cladosporium carpophilum*) and brown rot (*Sclerotinia fructicola*) without injury to the fruit, but it caused a leaf-spotting which became progressively greater as the material on the leaves aged. It produced no ill effect on cherry, on which, however, it failed to control leaf spot (*Coccomyces hiemalis*).

Hickman (C. J.), Marsh (R. W.), & Wilkinson (E. H.). **Preliminary experiments on the use of oil-soluble copper compounds as fungicides.**—*Ann. appl. Biol.*, xxx, 2, pp. 179–183, 1943.

A selection of oil-copper mixtures was examined for solubility and stability, and the fungicidal and phytocidal properties of the more promising combinations tested in the laboratory during 1942 on conidia of *Macrosporium* [*Stemphylium*] *sarciniforme*, *Venturia pirina*, and a *Botrytis* sp. from onion foliage. It was found that turpentine, 'palustrex' pine oil, and white spirit were injurious to onion foliage, whereas cottonseed oil and white oil were harmless. Copper salts dissolved in white oil, white spirit, turpentine, or pine oil had a higher fungicidal value than those dissolved in cottonseed oil. A solution of copper 3 : 5-di-*iso*propyl salicylate in oil was consistently more fungicidal than Bordeaux mixture of the same copper concentration. It is suggested that further investigation will probably disclose the existence of more such oil-soluble copper compounds of high toxicity. In small-scale field trials against onion mildew (*Peronospora schleideniana*) [*P. destructor*], copper 3 : 5-di-*iso*propyl salicylate, dissolved in white oil to a concentration equivalent to 0·01 per cent. copper by weight, was not phytocidal when atomized three times at monthly intervals on to the onion foliage, while the higher concentration (0·1 per cent.) of the same material was markedly injurious. The material failed to control mildew. The method of atomizing was found to be convenient for small-scale work; it gave perfect wetting of the foliage and was most economical of material.

Parker-Rhodes (A. F.). **Studies in the mechanism of fungicidal action. V. Non-metallic and sodium dithiocarbamic acid derivatives.**—*Ann. appl. Biol.*, xxx, 2, pp. 170–179, 4 graphs, 1943.

In continued studies on the fungicidal action of various chemicals [*R.A.M.*, xxii, p. 101], the author investigated, with the help of the theory of variability, the fungicidal possibilities of 13 derivatives of dithiocarbamates and thiuram sulphides [ibid., xxii, p. 364], all compounds prepared for use in the processing of rubber and thus readily available. *Macrosporium* [*Stemphylium*] *sarciniforme* was used as the test organism. From the results obtained in toxicity tests it is inferred that: (*a*) dithiocarbamates are decomposed by the spores to a greater or lesser degree into amine and carbon disulphide, both being toxic; (*b*) the amines can be absorbed only in a combined form, which may be the dithiocarbamate itself but is more probably a derivative, possibly an ester; (*c*) the carbon disulphide probably acts through the mediation of a thiocarbonate; and (*d*) thiuram sulphides act through being decomposed to dithiocarbamates (or their derivatives mentioned above). The monosulphides were largely, and the disulphides slightly, decomposed, in the latter case with reduction. The methyl derivatives of dithiocarbamic acid were by far more toxic than any others tested, and, at least with regard to the test fungus, are the only ones to show any promise of practical usefulness. Their greater toxicity is attributed to the shortness of the hydrocarbon chain. It is concluded that the role of the carbon disulphide is chiefly that of a chemical carrier of the amino group, but that, owing to the negative index of variation of the spores to the latter, the carbon disulphide is essential for completing the toxicity. Work is in progress on the fungicidal action of heavy-metal salts of the dithiocarbamic acids.

Martin (H.). **The evaluation of fungicides. Addendum.**—*J. Soc. chem. Ind., Lond.*, lxii, 7, p. 112, 1943.

Notes on the chi-square test are furnished in response to requests by readers of the author's paper on the evaluation of fungicides [*R.A.M.*, xxii, p. 320].

Ekstrand (H.). **Spridningsmedel för besprutningsvätskor.** [Spreaders for spray solutions.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, vii, 2, pp. 3–4, 1943.

Tables are given showing the results of experiments to determine the relative merits of a number of fungicidal solutions and spreaders, which were graded through a scale of 0 to 5, the latter figure denoting sufficient coverage of the sprayed surface and the former complete inadequacy of dispersal. The most effective of the fungicides tested was an oil emulsion known as 'jofurolja' (3 per cent.) and a 'special' form of the same preparation (2 per cent.), both allotted the grade of 5, good results (4·5) also being obtained with these two at a strength of 1 per cent. The grades of four other fungicides, viz., Ob 2300 (1 per cent.), Cu 35 (0·25 per cent.), lime-sulphur (3 in 100), and 1 per cent. Bordeaux were raised from 0·5 to 4 and 4·5 by the admixture of T.A. at the rate of 0·05 and 0·1 per cent., respectively, and to 3·5 and 4 to 4·5 by T.B. at 0·5 and 1 per cent., respectively, while the maximum increase with skim milk (10 per cent.) only brought Ob 2300 up to 2·5.

Whittaker (E. C.). **The care and maintenance of orchard machinery and equipment.**—*Agric. Gaz. N.S.W.*, liv, 3, pp. 114–115, 1 fig., 1943.

Brief practical directions are given for the care and maintenance of spraying appliances and packing shed equipment, both of which are liable to be neglected. Appliances need proper lubrication, protection of the pump and engine against grit, and when not in use during the summer the vat should be kept full of water. Flushing the apparatus with clean water after use and proper renovation at the end of the season are stressed.

Bisby (G. R.). **Geographical distribution of fungi.**—*Bot. Rev.*, ix, 7, pp. 466–482, 1943.

From a study of the geographical distribution of fungi [*R.A.M.*, xii, p. 579] the author concludes that species of phanerogams acceptable to-day outnumber such species of fungi by about five to one. There are, perhaps, three times as many phanerogams as fungi. In spite of this, species of fungi probably outnumber species of phanerogams in any particular state or country, and the smaller the area, the greater the preponderance of fungi. The geographical distribution of fungi is primarily controlled by that of the hosts and substrata. As a parasite is usually able to attack more than one host species, its geographical range will probably be greater than that of any one of its hosts. Other factors influencing fungal distribution are climate, which is often important, nature and density of phanerogams, light, and human activities.

Bitancourt (A. A.). **Plant pathology in Brazil.**—*Chron. bot.*, vii, 7, pp. 318–320, 1943.

After touching on the early history of plant disease research in Brazil, where a Laboratory of Plant Pathology was founded by the Federal Government in 1910 under A. Puttemans, the Instituto Biológico de Defesa Agrícola in 1920, and the Instituto Biológico de São Paulo (where the staff now exceeds 600) in 1928, the author mentions the facilities for studying plant pathology that exist in the country to-day, and states that the science has developed rapidly in Brazil during the past ten years. Delay in the introduction of modern methods of disease control has largely been due to the fact that Brazil's two chief crops, coffee and cotton, are

comparatively free from disease, but the rapid development of citrus-growing since 1930 has necessitated up-to-date methods of disease control in this crop. The paper concludes with a discussion of the problem of plant quarantine.

Macara (T. J. R.). **Dried meat. II. The growth of moulds on dried meat.**—*J. Soc. chem. Ind., Lond.*, lxii, 7, pp. 104–106, 1943.

At the Low Temperature Station for Research in Biochemistry and Biophysics, Cambridge, the writer investigated the conditions of temperature, relative humidity, and water content permitting the growth of moulds (*Penicillium* and *Aspergillus* spp.) on air-dried, pre-cooked meat of standard quality [cf. *R.A.M.*, xiii, p. 442]. The minimum humidity at which mould development occurs was found to be very slightly below 75 per cent., corresponding to a water content of 10 per cent. in dried meat containing 40 per cent. fat. This minimum value does not vary appreciably within a temperature range of 20° and 37° C. The incidence of infection in some experimental samples from overseas accorded with the laboratory data.

Yarwood (C. E.). **Association of thrips with powdery mildews.**—*Mycologia*, xxxv, 2, pp. 189–191, 1943.

Thrips tabaci was observed in different localities in California in association with *Uncinula necator* on vine, *Sphaerotheca pannosa* on rose, *S. humuli* on strawberry, *Erysiphe cichoracearum* on cantaloupe, and *E. polygoni* on clover and *Oenothera* sp. In dish cultures, thrips transferred to mildewed vine and rose leaves throve better than those on healthy leaves. The insects appeared to feed on and destroy established mildew colonies on rose and vine leaves, but appeared to be of no economic importance.

Cunningham (I. J.). **The sclerotia of Sclerotinia sclerotiorum (Lib.) Mass. are not poisonous.**—*N.Z.J. Agric.*, lxvi, 6, p. 372, 1943.

When several pounds of the sclerotia of *Sclerotinia sclerotiorum* were fed to six rats (for 11 weeks) and a pig (for 5 days), no harmful effects ensued, and it is concluded that the sclerotia of this fungus are not poisonous to such animals.

Armitage (F. D.). **II.—Further uses for chlorazol black E and a new stain for botanical sections.**—*J. R. micr. Soc.*, Ser. iii, lxiii, 1–2, pp. 14–19, 2 pl., 1943.

Chlorazol black E is recommended as a histological stain for the microfungi, and as particularly useful for photomicrographic purposes. The author obtained good results also with the following mixture: two parts by weight each of phenol crystals, lactic acid, and water, mixed with one part of pure glycerine, and sufficient chlorazol black E added to give the mixture the appearance of Indian ink. Supplies of chlorazol black E can be obtained from British Drug Houses, Ltd.

McCready (R. M.), Owens (H. S.), & Maclay (W. D.). **The use of fibrous sodium pectate as a substitute for agar in bacteriological gels.**—*Science*, N.S., xcvii, 2523, p. 428, 1943.

As a substitute for agar in the pure culture of bacteria very satisfactory results have been secured at the Western Regional Research Laboratory, United States Department of Agriculture, Albany, California, with fibrous sodium pectate, the preparation and properties of which have been described by Baier and Wilson (*Industr. Engng Chem.*, xxxiii, p. 287, 1941). The medium is purchasable on the market (California Fruit Growers' Exchange, Ontario, California), but purification is advisable by suspension in 60 per cent. alcohol, adjustment to P_H 7·5 with sodium hydroxide, filtration, and desiccation *in vacuo* at 60° C. Directions are given for the preparation of a nutrient gel by the addition of a 2·5 per cent. solution of fibrous pectate to a nutrient broth. The Northern Regional Research Laboratory, Illinois, also reports good results with moulds on the new substratum.

Stampa (G.). **Present state of the biological synthesis of fats and its industrial possibilities.**—*Int. Rev. Agric.*, xxxiii, 12, pp. 428T–435T, 1942.

In this paper the author discusses various aspects of the problem of using the carbohydrates in rejected fruits, canning industry trash, and many agricultural waste products to obtain fats by biological synthesis effected by fungi, particularly *Endomyces vernalis*, *Penicillium javanicum*, and *Oidium* [*Oospora*] *lactis* [cf. *R.A.M.*, xiv, p. 522].

Ainsworth (G. C.). **Virus nomenclature.**—*Ann. appl. Biol.*, xxx, 2, pp. 187–188, 1943.

The author considers that the development of an international nomenclature for viruses is work for the future, but that the standardization of the English names of virus diseases (from which common names for viruses can always be derived) would greatly facilitate the work of plant pathologists. He also urges that in compiling lists of synonyms a distinction should be made between 'obligate' synonyms (those based on the same type) and 'facultative' synonyms (based on different types) [*R.A.M.*, xxii, p. 176].

Holmes (F. O.). **A comment on Dr. Johnson's 'Virus Nomenclature and Committees'.**—*Chron. bot.*, vii, 5, pp. 201–202, 1942.

In these comments the author disagrees with some of Professor J. Johnson's opinions already noticed in this *Review* [*R.A.M.*, xxi, p. 343].

Robbins (W. J.), Kavanagh (Virgene W.), & Kavanagh (F.). **Growth substances and dormancy of spores of Phycomyces.**—*Bot. Gaz.*, civ, 2, pp. 224–242, 1 fig., 3 graphs, 1942.

The failure of spores of *Phycomyces blakesleeanus* to germinate on mineral-dextrose agar medium containing thiamin is interpreted as a dormancy phenomenon. The addition to the medium of extracts of potato tubers or other natural products of sodium acetate or the sodium salts or other organic acids increased germination to nearly 100 per cent. Treatment of spores with aqueous pyridin had the same favourable effect.

Ossiannilsson (F.). **Studier över de svenska Potatisfältens insektfauna och dess betydelse för spridning av virussjukdomar. I. Hemiptera, förekomst och utbredning.** [Studies on the insect fauna of the Swedish Potato field and its importance in the spread of virus diseases. I. Hemiptera, occurrence and distribution.]—*Medd. Växtskyddsanst., Stockh.*, 39, 72 pp., 9 figs., 5 diags., 4 maps, 1943. [German summary.]

Full particulars are given of the characteristics, biology, and geographical distribution in Sweden and elsewhere of *Myzus persicae*, *M. pseudosolani*, *Macrosiphum gei*, and *Aphis rhamni*, vectors of potato virus diseases, and of a number of other Hemiptera, the suspected connexion of which with potato viruses has not been conclusively established.

Lihnell (D.). **Om bladrullsjukans spridning i Potatisfälten.** [On the spread of leaf roll in the Potato field.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, vii, 2, pp. 6–11, 1 fig., 1 map, 1943.

An experiment is in progress in 32 localities throughout Sweden to determine the extent of the spread of potato leaf roll in the field, the results of which for 1941 are now available. At each place the tubers are planted out in five rows of ten tubers, of which the middle one is occupied by 100 per cent. diseased material and the two outer ones on either side by healthy seed of the susceptible Magnum Bonum and Ostergyllen varieties. Of the nine test areas in which a more or less

extensive spread of infection was recorded (all in low-lying or coastal districts of the south) [*R.A.M.*, vii, p. 596], Alnarp provided the highest figures with a total of 27 leaf-roll plants, 11 of Östergyllen and 16 of Magnum Bonum. More surprising is the occurrence of 12 infected plants (six of each variety) at Uppsala, where the Botanic Garden presumably harbours an abundance of aphid vectors, since environmental conditions are not otherwise propitious.

Sheffield (F[rances] M. L.). **Value of phloem necrosis in the diagnosis of Potato leaf-roll.**—*Ann. appl. Biol.*, xxx, 2, pp. 131–136, 1 pl., 1943.

The examination during 1941 and 1942 of a number of potato varieties showed that a phloem obliteration and necrosis restricted to the primary phloem of bicollateral bundles, was present in all of 179 plants of 33 varieties showing secondary leaf roll [*R.A.M.*, xi, pp. 121, 741], but not in any of 83 healthy plants of 20 varieties. The necrotic cells stained with those reagents generally used to show lignified tissue, and also reacted with phloroglucinol. Necrosis was found always to occur before leaf-rolling set in, starting near the base of the main stem and spreading upwards. The amount of necrosis varied in different plants, but was in any one variety correlated with the severity of external symptoms. When these were severe, necrosis could be found in almost all parts of the plant, except the stolon, tubers, and roots; when mild, it was confined to one or two strands of primary phloem extending vertically to only two or three internodes. Necrosis may occur equally in the internal and external primary phloem, or it may be confined to one or may be severe in one and slight in the other. The number of affected strands is usually greatest at the nodes. In a few artificially infected plants with primary leaf roll infection, slight necrosis was found to develop, spreading upwards from the place of inoculation. It was not determined whether, as in secondary leaf roll, the necrosis is present before rolling occurs.

Comparison with some other abnormal plants yielded no evidence that any other pathogen or physiological condition can cause a necrosis confined to the primary phloem strands. It is therefore concluded that the type of necrosis described may be of practical value for detection of leaf roll. A technique suggested for the diagnosis of secondary leaf roll is outlined as follows: a piece is taken from near the base of a main stem extending from about 1 in. below soil-level to about above the sixth node above ground; it is trimmed off and sectioned into smaller pieces; these are cut by hand through the nodes and put into phloroglucinol solution (1 per cent. in 50 per cent. alcohol) on a slide for one minute, then the solution is drained off and replaced for one minute by 50 per cent. hydrochloric acid; this is in turn drained off, the section mounted in water and examined under the microscope at about × 100. In a healthy plant the xylem will appear purplish-red, while all other tissues will be colourless, except some of the phloem fibres, which may be pink or red. In a leaf roll-infected plant, on the other hand, some of the primary strands will be of a yellowish-red. It may be expected that if leaf roll is present phloem necrosis will be detected in some of the six nodes under examination. It is suggested that in examining an unfamiliar variety, a healthy stem and if possible also one known to be infected with leaf roll should be examined for comparison.

Scottish Society for Research in Plant Breeding. Report (abridged) by the Directors and Report of the Director of Research to the Annual General Meeting, 15th July, 1943.—33 pp., 1943.

The following items of interest occur in the Report of the Director of Research [cf. *R.A.M.*, xix, p. 723]. W. Black states that a large number of new potato seedlings in the early stages of trial have shown resistance to blight [*Phytophthora infestans*], immunity in the field from viruses A and X, and general promise of

fulfilling agricultural requirements, but no complete immunity from leaf roll has yet been found, though certain varieties have some resistance.

P. infestans does not appear to be completely stable, as a distinct, more virulent strain was isolated from it. Some varieties are immune from the original, A, strain used for testing varietal reaction, but succumb to strain B. Both strains were used in the 1942 tests with about 5,000 plants, and all the seedlings which were immune from strain B were also immune frrom strain A. Resistance to the two strains was found to be controlled by two dominant genes, Ra and Rb. A satisfactory proportion of the experimental material was resistant to both strains. This material included progenies bred from *S*[*olanum*] *tuberosum* varieties and a 48-chromosome hybrid derived from *S. rybinii* ($2n = 24$) and *S. demissum* ($2n = 72$). The fertility of these progenies in some cases reached 100 per cent.

G. Cockerham and C. H. Cadman state, *inter alia*, that an unrecorded but suspected virus has been located within wild potato material.

Gilmore (L. E.) & Robinson (C. H.). **Studies in seed Potato treatments. Testing and adjusting corrosive sublimate solutions I. Laboratory control method.**—*Sci. Agric.*, xxiii, 11, pp. 676–681, 1943.

The authors describe a simple laboratory test for checking the concentration of mercuric chloride solutions at the initial and successive seed potato treatments for the purpose of adjusting the solutions to the effective strength. It consists in titrating 100 ml. of the mercuric chloride solution intended for treatment (of a concentration of 1 : 1,000 or 0·5 : 1,000) together with a 0·2 per cent. starch solution against a standard test solution containing 5 gm. potassium iodide and 0·5 gm. copper sulphate pentahydrate ($CuSO_4.5H_2O$) per l., until a blue colour appears. The titration result is then referred to an adjustment table to obtain the amount of 5 per cent. mercuric chloride solution required to adjust the treatment solution to its full strength.

Gilmore (L. E.) & Robinson (C. H.). **Studies in seed Potato treatments. Testing and adjusting corrosive sublimate solutions II. Field control method.**—*Sci. Agric.*, xxiii, 11, pp. 682–687, 1943.

Deterioration of mercuric chloride solutions in the hands of inexperienced farmers is stated to have often made ineffective seed potato treatment against *Rhizoctonia* [*Corticium solani*], scab [*Actinomyces scabies*], and black leg [*Erwinia phytophthora*]. Instructions are given for the preparation of solutions, and users are warned of the deterioration produced by contact with metals. The actual treatment should be preceded by soaking the tubers five to six hours in clean water to remove soil and other vegetable matter.

A field control test, originally developed in 1935, is described for the adjustment of the strength of the treatment solutions. The procedure is essentially the same as used in the laboratory [see preceding abstract]: the blue liquid test mixture is added to the partially exhausted treatment solution in a 100 ml. graduate till the blue colour disappears. The graduate reading of the volume of the liquid is then referred to the adjustment table to obtain the amount of stock mercuric chloride solution necessary to adjust the solution to the effective strength.

Goss (R. W.) & Livingston (J. E.). **The influence of crop rotations on the occurrence of scab, Rhizoctonia, and Fusarium wilt in Potatoes under dry-land conditions in western Nebraska.**—*Rep. Neb. Potato Imp. Ass.* 22, pp. 22–27, 1941.

Records were taken on the incidence of scab [*Actinomyces scabies*], *Rhizoctonia* [*Corticium solani*], and Fusarium wilt [*F. solani* var. *eumartii*: *R.A.M.*, xxi, p. 39], the three chief soil-borne potato diseases in western Nebraska, on the Bliss Triumph variety in the $\frac{1}{10}$-acre rotation plots at the Box Butte Experiment Farm from

1931 to 1939, all the data being based on 100 lb. random samples from each plot. All three diseases were most severe in the years of heavy rainfall and correspondingly high yields, and least in evidence in the very dry seasons of 1934 and 1936. Cultivation in the same plot for two consecutive years led to a marked increase in the amount of scab and *C. solani*, and in 1932 the plot that had been under potatoes for three years in succession yielded only 51·8 per cent. sound tubers, compared with an average of 91·9 per cent. in the other plots. *Fusarium* wilt, on the other hand, did not increase during the first three consecutive years of potato cultivation, when the percentage of infection fluctuated between 2 and 5 per cent. Less than half as much scab and *C. solani* infection developed in the three-year rotation as in the continuous plots, and in six out of seven years the incidence of *F. solani* var. *eumartii* was also lower in the former than in the latter. From the standpoint of scab control there was no advantage in five- as against three-year rotations, and the differences in favour of the former for the other two diseases were not large enough to be significant. The nature of the preceding crop (maize, wheat, or summer fallow in the quinquennial, and maize, wheat, or beans in the triennial rotations) was less important than the duration of the period between two potato crops. These results are in marked contrast to those obtained in the irrigated areas of the State, where the type of the preceding crop exerts a decisive influence.

Foister (C. E.). **On the control of Potato skin spot disease.**—*Ann. appl. Biol.*, xxx, 2, pp. 186–187, 1943.

The skin spot disease of potato, caused by *Oospora pustulans* [*R.A.M.*, xix, p. 41], is stated to affect at times the potential sales value of tubers of certain varieties, such as King Edward, Majestic, Kerr's Pink, Arran Banner, and Sharpe's Express, and to cause a considerable amount of 'blindness', particularly in King Edward and Majestic, due to invasion of the eyes by the causal fungus. In experiments conducted in Scotland from 1941 to 1943, ware and seed of King Edward and Kerr's Pink potatoes were dipped for 1 minute in organo-mercurial solutions A and B prior to pitting. Examination of the tubers in the following spring showed that 87·65 to 98·51 per cent. of the tubers dipped in solution A and 90·60 to 97·90 per cent. of those dipped in B were free from disease, as against only 2·43 to 11·86 per cent. of the untreated control. The balance of the dipped lots fell entirely into the slightly affected group, while the untreated controls had some severely affected tubers. It was also shown that dipped tubers, when subsequently planted out, had a quicker and stronger emergence than the control, the final emergence percentage of the dipped sets being 99·2 and 100 for solutions A and B, respectively, as against 87·8 for the control, or an advantage of the dipped sets of 11·4 to 12·2 per cent. over the control. An approximate estimate of blanking made by a farmer assessed it at 0·5 to 1 per cent. for dipped stocks, and at 10 per cent. for the control. Dipped tubers produced a greater weight of crop: the seed size of 1¼ to 1¾ in. yielded with solution A, 100 lb.; solution B, 110·15 lb.; and control, 67·53 lb., or a loss of 32·47 to 42·62 per cent. of potential seed. It is noted as a point of interest that the total weight seems, at least under the conditions of the present experiment, to be related to the emergence percentage, e.g., loss of emergence in the untreated controls, 11·4 to 12·2 per cent.; loss of crop, 11·49 to 11·8 per cent.

Blair (I. D.). **Behaviour of the fungus Rhizoctonia solani Kühn in the soil.**—*Ann. appl. Biol.*, xxx, 2, pp. 118–127, 1943.

The saprophytic behaviour of *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xxi, p. 412] was studied in natural unsterilized soil by the Rossi-Cholodny soil-plate method [ibid., xiv, p. 469]. Tested in glass tumblers over a range of soil moisture

contents from 30 to 80 per cent. saturation, the fungus grew best at the lowest and least at the highest level. This decline in growth was attributed to a decrease in soil aeration accompanying rising soil moisture content, since in sand, where aeration is better than in any soil, the growth of the fungus was least affected by the rise of soil moisture content. This hypothesis was confirmed in tests with the same range of soil moisture contents, in which forced aeration of the soil was found to increase significantly the growth of the fungus, while the admixture of bentonite with sand, which retards the natural aeration, had the expected effect of significantly reducing the growth. A neutral soil reaction was optimal for the growth of *C. solani*, which grew well over the range P_H 5·8 to 8·1.

In experiments with glass tubes, 30 cm. long, containing sand, growth of the fungus ceased after 13 days when the hyphae extended to some 5 cm. beyond the inoculum; in three different soil types, on the other hand, the growth continued for another eight days for a further 12 to 17 cm. The removal of the agar inoculum disk from the glass tube after two days or the substitution of mycelial strands as inoculum, diminished growth of the fungus greatly in the sand, but affected it only slightly in the three soils. It is concluded from these results that the fungus derives nourishment from the soil, although a certain 'food potential' of the inoculum may be necessary to initiate, though not to maintain, its saprophytic growth through the soil. Development of sclerotia was observed against the glass walls up to the sixth day after inoculation, none forming farther than 6 cm. from the inoculum. Sclerotial production was very sparse in sand (7 as against 39, 59, and in 64 in the Hardwood, allotment, and Woburn soils, respectively), probably owing to a scarcity of inorganic nutrients. In radish seedlings sown in two types of soil at a range of distances from the agar inoculum disk, the percentage of pre-emergence killing tended to decrease with increasing distance of the seed from the inoculum. In both soil types, 100 per cent. of seedlings damped-off after 16 days at the 4 cm. distance, while the percentage decreased again at distances exceeding 4 cm. Essentially similar results were obtained with the same two soil types, but at each of the two moisture levels, 33 and 50 per cent. saturation, the progress of damping-off being, as was indicated by earlier tests, more rapid at the lower level.

The addition of organic materials, such as grass, farmyard manure, adco and city refuse composts, wheat straw, and lucerne meals, was found to depress the growth of the fungus in all soils tested. When, on the other hand, both the soil and the organic supplements were sterilized before mixing, the growth of the fungus was not depressed. The inoculation of sterilized soil-organic meal mixtures with *C. solani* and mixed fungus inocula (inoculum A = *Penicillium terrestre*, *P. intricatum*, and *Aspergillus flavipes*; and B = *Gliocladium roseum*, *Rhizopus elegans*, and *Trichoderma viride*) resulted in a depression of growth of *C. solani* to the level of similarly inoculated unsterilized series. In a parallel experiment with soil receiving no organic supplements, sterilization failed to increase the growth of *C. solani*, but the addition of mixed fungus inocula significantly depressed it both in the non-sterilized and the sterilized soil, particularly in the latter. These experiments are taken to demonstrate that the depressing effect of the organic supplements upon the growth of the fungus through unsterilized soil is due to microbiological action. It was further shown that (1) the cellulose-decomposing ability of *C. solani* is weaker than that of eight other fungi selected as typical cellulose decomposers, (2) the addition of nitrogen fails to counteract completely the depressing effect of organic supplements upon the growth of the fungus or to increase the growth in soil receiving no such supplements, and (3) the reduction of the carbon dioxide content of the soil atmosphere (achieved by the introduction of a saturated solution of alkali into the experimental clay crocks) improves the growth of *C. solani* in the soil-straw meal series until it almost equals that in the

untreated soil. It was found that where either grass or straw meal had been added to the soil the optimum P_H value for growth rose from 7 to 8, this result agreeing with the hypothesis that the accumulation of respiratory carbon dioxide is one of the factors limiting the growth of *C. solani* in soil treated with organic grass or straw meal.

Cralley (E. M.) & Adair (C. R.). **Effect of irrigation treatments on stem rot severity, plant development, yield, and quality of Rice.**—*J. Amer. Soc. Agron.*, xxxv, 6, pp. 499–507, 1943.

A tabulated account is given of experiments conducted from 1933 to 1940 at Stuttgart, Arkansas, to determine the effect of various irrigation treatments on the severity of stem rot (*Leptosphaeria salvinii*), plant development, yield, and milling quality of the Supreme Blue Rose, Caloro, Lady Wright, Early Prolific, Fortuna, and Kameji × Blue Rose rice varieties. The virulence of the fungus was slightly reduced by withholding water from the experimental plots for certain periods before harvest [*R.A.M.*, xiii, p. 395] and by alternate draining and submergence during the latter part of the growing season. The average yields, however, were somewhat higher from plots irrigated normally, i.e., submerged continuously during the late vegetative period. The data indicate that early draining, practised in fields lightly infested with stem rot, does not increase rice production. None of the modifications of the normal irrigation system augmented plant height, tillering, panicle weight, or yield, nor did they improve the milling quality of the crops.

Chin (W. F.). **A preliminary study on the physiological differentiation of Fusarium fujikuroi (Saw.) Wr.**—*Nanking J.*, ix, pp. 305–321, 1940.

A number of isolates of *Fusarium* [*Gibberella*] *fujikuroi* (Saw.) Wr. were compared for pathogenicity to rice by planting aseptically germinated seedlings in inoculated sterilized soil cultures on mixed steamed carrot and maize stems. The cultures were divisible into three groups, all causing pallor or yellowing of the plants, while one also induced dwarfing, the second elongation, and the third no effect on the size of the host. All cultures were found to grow well on natural plant media (carrot, potato, sweet potato, and radish agar slants, maize and *Dolichos* stems, and rice straw), and could not be satisfactorily distinguished on these media. There was some difference in the growth rates on potato dextrose agar, the dwarfing type developing most rapidly, the elongation type [*R.A.M.*, xx, p. 594] moderately fast, and the 'normal' type most slowly.

When grown on Knop's solution or a modification of Richards's liquid medium, all the types produced a toxin which resulted in yellowing, stunting, production of brown lesions, withering, and usually death of the plants. There was some slight correlation between intensity of action at low dilutions and degree of stunting of plants in infected soil, but the toxicity test is considered unsuitable as a means of differentiating the three main types.

Smith (K. M.). **A virus disease of Atropa belladonna.**—*Parasitology*, xxxv, 3, pp. 159–160, 1 pl., 1943.

A preliminary account is given of a virus disease of *Atropa belladonna*, first observed on specimens from Suffolk in 1941 and again recorded in 1942 in Surrey, where the crop is being cultivated for medicinal purposes. This is believed to be the first report of a spontaneous infection of virus origin on the host in question. Under outdoor conditions the plants develop severe foliar and stem necrosis, while in the greenhouse the leaves display a somewhat patchy mottling and a number of necrotic spots. The virus is transmissible by means of the sap to its own host (with much difficulty), *Hyoscyamus niger*, *Solanum nigrum*, *Datura stramonium*,

White Burley and Turkish tobacco, *Nicotiana glutinosa*, and Canadian Wonder French bean.

The dilution end point of the virus in crude extracted sap lies between 1 in 10,000 and 1 in 1,000. It is not destroyed by five minutes' exposure to a temperature of 75° C., the inactivation point probably lying between 75° and 80°. Positive infections were obtained after six (but not eleven) days' ageing in extracted sap at room temperature.

ARRUDA (S. C.). **A Cana de Açúcar e o problema das doenças.** [Sugar-Cane and the disease problem.]—*Biológico,* vii, 10, pp. 271–280, 1941.

This is a concise survey of the distribution, symptomatology, and possibilities of control of the fungal, bacterial, and virus diseases of sugar-cane, with special reference to the conditions prevailing in São Paulo and elsewhere in Brazil.

ARRUDA (S. C.). **A história das grandes epifitias da Cana de Açúcar.** [The history of the major epiphytotics of Sugar-Cane.] –*Biológico*, vii, 11, pp. 313–318, 2 diags., 1 graph, 1941.

The epidemic of mosaic among the susceptible 'noble' sugar-cane varieties, exclusively cultivated in São Paulo at the time of the introduction of the virus into all the chief American centres of the industry (1920 and onwards), is estimated to have caused a reduction in yield, between 1923 and 1925, of 58 per cent., representing a financial loss of $10,990,000,000 [*R.A.M.*, ix, p. 807]. The substitution for this susceptible group of canes of resistant varieties, such as P.O.J. 213 and 36 and Co. 281 and 290, led to a rise in output from 477,000 tons per ha. in 1925 to 1,965,000 in 1932.

Brazil was the first country to suffer collapse of the sugar-cane industry through the ravages of *Phytomonas* [*Xanthomonas*] *vasculorum*, which occurred in the State of Bahia in 1860.

Notes are also given on the sereh and red rot [*Colletotrichum falcatum*] epidemics in Java (1882) and the West Indies (1895), respectively, and the paper concludes with a survey of the work, initiated at the time of the former and still proceeding, on the development of disease-resistant varieties.

MCMARTIN (A.). **Red rot in Sugarcane in Natal.**—*S. Afr. Sug. J.*, xxvii, 5, pp. 209, 211, 1943.

Red rot of sugar-cane (*Colletotrichum falcatum*), first detected in Natal by the writer towards the end of 1941 [*R.A.M.*, xxi, p. 222], has been responsible for considerable losses in some areas, a reduction of 50 per cent. being not uncommon. Of the released varieties, Co. 290 and P.O.J. 2725 are the only ones affected, Co. 281 and Co. 301 being apparently resistant. Cases have been observed at the Mount Edgecombe Experiment Station in which dead Uba canes were found to be producing spores of the pathogen without showing any sign of the typical red internal discoloration, suggesting that similar material may possibly have been the source of the present outbreak, and also that red rot may have killed the dead sticks of Co. 290 found in other areas. In this event, infection may be fairly widespread but only developing on an important scale in regions where suitable climatic conditions prevail. The prevalence of the disease at high elevations in Natal is tentatively attributed to the persistence of damp mists over the fields for longer periods than in the lower-lying coastal districts.

One method of infection by *C. falcatum* in the field, apparently not recorded from any other country, is through the leaf sheaths of one-year-old cane, on which discoloured areas somewhat resembling those of eye spot [*Helminthosporium sacchari*] are formed, the fungus passing thence into the young internodes. Pre-

sumably it travels upwards from the disintegrating refuse at the stem bases along the outside of the stem or leaf sheaths.

C. falcatum is constantly associated with a *Fusarium* of the *F. moniliforme* [*Gibberella fujikuroi*] group, which can be grown in culture for a longer period than the red rot fungus and still retain its pathogenicity (30 days in one experiment). Canes inoculated with combined cultures of the two organisms developed more characteristic symptoms of red rot than did those infected with either singly. In the field *G. fujikuroi* causes both the top rot familiar in other countries and an internal red discoloration, and the evidence indicates that it may be an important factor in the etiology of red rot, and not merely a secondary invader. The symptoms induced by inoculation with *C. falcatum* vary considerably, the age of the culture being one of the determining factors; at four to six days the pathogen appears to exert its most typical effects.

D[odds] (H. R.). **Experiment Station notes.**—*S. Afr. Sug. J.*, xxvi, 4, p. 213; 7, pp. 367, 369; 8, pp. 419, 421, 1942; xxvii, 2, p. 99; 6, p. 271, 1943.

The following items, *inter alia*, occur in the Botanist's Reports incorporated in these notes from the South African Sugar Association's Experiment Station, Mount Edgecombe, Natal. An unusually heavy outbreak of ring spot (*Leptosphaeria sacchari*) on Co. 281 was observed during April, 1942, imparting a rusty appearance to the affected areas, and the same variety has recently also been extensively attacked by *Cercospora longipes*.

During July, 1942, the following varieties in a field collection were found to be infected by red rot [*Colletotrichum falcatum*: see preceding abstract]: Clarke's Seedling, Co. 419, Black Cheribon, H.M. 619, S.C. 12/4, J. 247/B, R.P. 8, and M.P.R. 151, while (Co. 421 × Co. 312) and N. Co.'s 294, 296, 297, 300, 320, 321, 288, 285, 284, 283, 278, 258, 260, 262, and 265 were attacked in the seedling propagation plots. In August, 1942, the disease was further detected on P.O.J. 2725, M.P.R. 28, and 61, S.W. 499, B. 726, and N.Co.'s 312 and 257, and in February, 1943, on N.Co.'s 357, 352, 346, and 293.

Streak was found in July 1942, on Co. 455, N.M. 186 and 191, and Kham, and in June, 1943, on N.Co. 162.

In the latter month, *Puccinia kuehnii* was observed for the first time at the Experiment Station on Co. 301. At the same time, a survey to determine the extent of pineapple disease [*Ceratostomella paradoxa*] on Co. 331 revealed its presence in every field in which the variety was grown. The fungus appears to be present on the outside of the stalks, entering them when they are cut and used for planting. Treatment of the cut ends with mercuric chloride prevented infection through this channel.

A leaf spot resembling the target blotch [*Helminthosporium* sp.] prevalent in Cuba was observed on M.P.R. 151, this being the first record of its appearance in Natal.

Stevenson (J. A.). **A possible reprinting of Saccardo's Sylloge Fungorum.**—*Phytopathology*, xxxiii, 7, p. 635, 1943.

A recent announcement by the Alien Property Custodian concerning the availability for republication of many technical books and sets of books of enemy origin suggests to those interested the possibility of the reproduction of the 25 volumes of Saccardo's 'Sylloge Fungorum' [cf. *R.A.M.*, xxii, p. 113]. It has been ascertained that the complete set could be secured at $200.00 per set if 100 subscriptions are forthcoming, while 300 would permit of a reduction to $150.00. These prices are based on an offset edition with a 10 per cent. photographic reduction of the type block.

Bose (S. R.). **Researches on Bengal Polyporaceae.**—University of Calcutta, Kirtikar Memorial Volume No. 1, 101 pp., 5 pl. (2 col.), 1942.

This volume, published in memory of Lt.-Col. K. R. Kirtikar, I.M.S., who devoted much time to the study of Bombay fungi, contains four papers on Bengal Polypores, embodying work carried out by the author with the assistance of Sudhirkumar Sen, S. N. Sarkar, N. C. Goswami, and P. N. Nandi. These papers, all of which are reprinted from various journals, deal with (1) the sexuality of *Polyporus ostreiformis* and *Polystictus hirsutus*, (2) enzymes of some wood-rotting Polypores [*R.A.M.*, xvii, p. 88], (3) the effects of radiation on some Polypores in culture, and (4) the nature of the colouring substance in coloured Polyporaceae [ibid., xxi, p. 36].

Zundel (G. L.). **Notes on the Ustilaginales of the world. III.**—*Mycologia*, xxxv, 2, pp. 164–184, 4 figs., 1943.

Among the species given in this annotated list of smuts from different parts of the world [*R.A.M.*, xvii, pp. 204, 704, 772; xix, p. 120] mention may be made of *Sphacelotheca schweinfurthiana* (Thüm.) Sacc. var. *minor* Zundel, var. nov., in which the spores measure 7 to 9 μ in diameter (found on *Saccharum arundinaceum* in China) and *Polysaccopsis hieronymi* (Schröt.) P. Henn. (syn. *Urocystis hieronymi*) on *Solanum* sp. in Argentina, Bolivia, and Brazil, in which the sori are 3 to 5 by 1·5 to 2·5 cm., and the globose to ellipsoidal or irregular, chestnut-brown, smooth spores are mostly 22 to 26 μ long.

Mundkur (B. B.) & Kheswalla (K. F.). **Dasturella—a new genus of Uredinales.**—*Mycologia*, xxxv, 2, pp. 201–206, 4 figs., 1943.

The authors erect a new genus, *Dasturella*, for two collections of rust on *Dendrocalamus strictus* and one on *Bambusa* sp. received at Pusa. Pycnidia and aecidia are unknown; the uredosori are minute, at first subepidermal, later erumpent, paraphysate, without peridia; uredospores sessile; teleutosori subepidermal, erumpent; teleutospores fascicled into large, coloured, sessile heads without cysts, 3- to 6-, rarely 7-celled. The type species, *Dasturella divina* (Sydow) comb. nov., found on leaves of *Dendrocalamus strictus* and *D.* sp. (nec *Bambusa* sp.) is characterized by sessile, almost globose to egg-shaped or ellipsoidal, echinulate uredospores measuring 18 to 26 by 15 to 23 μ, with a wall up to 1·5 μ thick, and 3 to 4 rather indistinct equatorial germ pores, sessile teleutospores arising from a cellular sheet, 59 to 114 by 8 to 17 μ, with side walls up to 1 μ thick, and the apical wall 3·7 to 11·7 μ thick, dark cinnamon-brown, 3- to 6-, rarely 7-celled.

Dasturella bambusina n.sp. (found on bamboo leaves) has ovoid to elliptical, finely echinulate, orange to pale yellow uredospores, measuring 22 to 29 by 17 to 21 μ with two germ pores, and sessile teleutospores, arising from a cellular sheet, 43 to 95 by 11 to 17 μ, with the apical wall 4·7 to 9·3 μ, and the side walls thin, deep cinnamon-brown, 3- to 5-celled.

Overholts (L. O.). **Mycological notes for 1939–40.**—*Mycologia*, xxxv, 2, pp. 243–254, 7 figs., 1943.

This annotated list of new and unusual fungi encountered during 1939 and 1940 includes *Poria cognata* n.sp. (on a stump of chestnut (*Castanea dentata*), Tennessee), *P. grandis* n.sp. (on rotted conifer logs, Tennessee), *Beauveria globulifera*, found on a locust in Pennsylvania, and *Stilbella acerina* n.sp., inhabiting spots on leaves of *Acer rubrum* in Tennessee in conjunction with *Phyllosticta acericola*.

Whetzel (H. H.). **The spermodochidium, an unusual type of spermatial fruitbody in the Ascomycetes.**—*Mycologia*, xxxv, 3, pp. 335–338, 1943.

The author introduces a new term, spermodochidium (pl. spermodochidia), which

he defines as a spermatial fruit-body in which spermodochia are housed in a distinctive lysigenous cavity in the tissues of the suscept plant. Previously (*Mycologia*, xxix, p. 135, 1937) the author defined the term spermodochium (pl. spermodochia) as a spermatial fruit-body characteristic of many Discomycetes, which is naked and not enclosed in a hyphal wall, the spermatiophores arising from a central or basal hyphal-centrum. Spermodochidia are stated to be typical of those *Sclerotinia* spp. that attack members of the Cyperaceae and Juncaceae, e.g., *S. duriaeana*, *S. longisclerotialis*, and *S. scirpicola*.

Whetzel (H. H.). **A monograph of Lambertella, a genus of brown-spored inoperculate Discomycetes.**—*Lloydia*, vi, 1, pp. 18–52, 6 pl., 7 figs., 1943.

In this monograph the author recognizes eight species of *Lambertella*, namely, the type species *L. corni-maris* [*R.A.M.*, xiv, p. 451], six new species, and one new combination. He proposes the establishment of a new family, the Sclerotiniaceae, to comprise those species, now commonly included in the Helotiaceae, in which the apothecia arise from a stroma. As the author now interprets the genera concerned, *Ciboria* is quite distinct from *Lambertella* [loc. cit.]. Observations and experiments indicate that the species of the latter genus are only mildly pathogenic, most, if not all, attacking only the mature or ripening organs of the suscepts. Harrison and El-Helaly [loc. cit.] found *Monilia* [*Sclerotinia*] *fructigena* to be 17 times as destructive to apples as *L. corni-maris*, and in the author's laboratory the latter readily invaded only ripe fruits of *Cornus mas*.

The most salient characters of the genus would appear to be the peculiar semi-stroma with its characteristic rind pattern and the coloured ascospores. The somewhat thickened face of the spore wall also seems to possess generic significance. Throughout the Sclerotiniaceae the characters of the stroma usually constitute the most reliable basis for generic segregation.

Blackwell (Elizabeth). **The life history of Phytophthora cactorum (Leb. & Cohn) Schroet.**—*Trans. Brit. mycol. Soc.*, xxvi, 1–2, pp. 71–89, 6 figs., 1 diag., 1943.

In this very detailed account of the life-history of *Phytophthora cactorum*, a paragynous, homothallic species, the author discusses the formation and germination of the oospores, chlamydospores, conidia, and zoospores as well as the perennation of the mycelium as old dormant portions of hyphae plugged off from the rest. The best method of distinguishing chlamydospores from oospores is to examine them between crossed nicols: the former are much brighter than the latter. The oospore is unique among the resting spores in that it has, *inter alia*, a period of rest after maturation during which it is difficult, if not impossible, to induce germination by artificial means. The cytological details of the fertilization of the oosphere, the maturation of the oospore, and the changes that take place in dormancy, are given in full. Each oospore is an independent product that matures in its own time and before germination each requires a further period corresponding to the 'after-ripening' period of seeds. At laboratory temperature this period may be six or seven months, but at just above freezing point it can be speeded up to one or two months. Even when the 'after-ripening' period is completed the oospore may continue to lie dormant for many months more. Throughout dormancy the oospore must be kept moist; desiccation means death. Preparation for germination is marked by the development of a characteristic dull, soft, granular appearance, in striking contrast to the bright, hard, and 'glassy' dead oospores. Various changes in the contents of the oospores take place before the emission of the germ-tube, and are described. The oospores that fail to germinate after the completion of the 'after-ripening' period, enter upon a second, even more resistant, dormancy, which may last many months. It is

concluded that the precise conditions necessary for the germination of oospores lie within very narrow limits and that, moreover, each oospore being a slightly differently organized unit, it may require a slightly different set of conditions.

Wei (C. T.). **Notes on Chinese Fungi X. Erysiphaceae of Western Szechuan.**—*Nanking J.*, xi, pp. 103–116, 1942.

These notes describe 22 species and varieties of Erysiphaceae collected in western Szechuan from 1938 to 1941 by the author and T. K. Zi. One new species and one new variety are described, and two new combinations proposed.

Ito and Hara (*Bot. Mag., Tokyo*, xxix, p. 338, 1915) erected the genus *Typhulochaeta* to accommodate a specimen occurring on *Quercus*, on the basis of what they regarded as a hitherto unrecorded type of appendage. The author finds that these are merely penicilliate cells, and true apical appendages. He therefore rejects the genus and renames the species *Erysiphe japonica* (Ito & Hara) Wei comb. nov. His specimens were collected on *Castanopsis* sp. and *Q. aliena*.

The name *Uncinulopsis polychaeta* (B. & C.) Wei on *Celtis sinensis* is 're-established according to Article 54 of the International Rules for Botanical Nomenclature'. Full reasons for the change are not given.

Uncinula miyabei (Salm.) Sacc. var. *aleuritis* Wei var. nov. on *Aleurites fordii* differs from the type in having fewer appendages and larger asci (50·4 to 71·4 × 37·8 to 56 μ).

Costa (A. S.). **Uma mela das sementeiras de Fumo causada por Rhizoctonia solani Kühn.** [A mildew of Tobacco seedlings caused by *Rhizoctonia solani* Kühn.]—*Biológico*, vii, 11, pp. 323–324, 2 figs., 1941.

Tobacco seedlings of the Turkish, Amarelinho, Sumatra, and Goiano varieties at the Institute of Agronomy, São Paulo, were recently attacked by a disease of the damping-off type, which was found to be caused by *Rhizoctonia* [*Corticium*] *solani*. The pathogen, which is of unusual occurrence locally, is favoured by an excess of humidity and thrives in shaded situations. Sterilized soil should be used for seed-beds, and cases of partial infection may be combated by exposure of the plants to direct sunlight.

Smith (T. E.) & Shaw (K. J.). **Pathogenicity studies with Fusaria isolated from Tobacco, Sweet Potato, and Cotton.**—*Phytopathology*, xxxiii, 6, pp. 469–483, 2 figs., 1943.

Pathogenicity trials with 53 collections of *Fusarium* from various commercial types of tobacco (considered representative of *Fusarium* wilt as it occurs in the United States, where it is commonly attributed to *F. oxysporum* var. *nicotianae* [*R.A.M.*, xix, p. 678]) demonstrated that the disease was caused by races of the fungus that were also pathogenic to sweet potato or cotton, but not to both. The race pathogenic to sweet potato was present in almost all collections in North and South Carolina and Georgia from flue-cured tobacco, and in Maryland from Maryland tobacco. Races pathogenic to sweet potato or cotton were collected in about equal numbers in Kentucky from Burley and dark tobaccos.

Pathogenicity trials with 22 collections of *Fusarium* from sweet potato (*Fusarium* wilt of which is commonly attributed to *F. bulbigenum* var. *batatas* and *F. oxysporum* f. 2) [ibid., xix, pp. 327, 388] showed that all were pathogenic to Burley tobacco and some to flue-cured tobacco, though none was pathogenic to cotton.

Trials with 19 collections of *Fusarium* from cotton (wilt of which is commonly attributed to *F. vasinfectum*) showed that all were pathogenic to Burley tobacco, slightly so or negative to flue-cured tobacco, and negative to sweet potato.

All 94 collections fell into three physiologic races on a basis of inoculation

results on flue-cured tobacco, Burley tobacco, sweet potato, and cotton, from which it is concluded that pathogenicity should be the principal criterion for the classification of wilt-producing species of *Fusarium*.

The use of crop rotations combining sweet potato and all types of tobacco is a dangerous practice, as both crops are susceptible to a common and widespread race of *Fusarium*. In areas where wilt is present on flue-cured tobacco the combination is exceptionally risky. The growth of Burley and dark tobaccos in rotation with cotton also appears to be unwise. Flue-cured tobacco may, however, safely be rotated with cotton.

Norris (D. O.). **Strains of spotted wilt virus and the identity of Tomato tip-blight virus with spotted wilt.** *J. Coun. sci. industr. Res. Aust.*, xvi, 2, pp. 91–92, 1 fig. (following p. 112), 1943.

The author has obtained evidence that the tomato spotted wilt virus is a complex of related strains, probably three, one of which (the necrotic) appears to be identical with tomato tip blight [*R.A.M.*, xviii, p. 420; xxi, p. 354]; the others are the ring spot and mild strains. No tip blight, indicating complete separation of the necrotic strain, has yet been observed in Australia.

Hill (A. V.). **Insect transmission and host plants of virescence (big bud of Tomato).** *J. Coun. sci. industr. Res. Aust.*, xvi, 2, pp. 85–90, 2 pl. (following p. 112), 1943.

This paper lists the 65 species of plants, belonging to 24 families, on which the virescence or greening, which appears to be due to tomato big bud virus [*R.A.M.*, xx, pp. 182, 235], has been observed in New South Wales. Greening of the floral parts is characteristic of the disease, which generally appears after mid-December, but occurs in summer-flowering annuals as early as November. At Canberra, in 1941–2, over 50 per cent. of annual aster (*Aster* sp.) plants were affected. Spring-flowering annuals were unaffected, but if abnormal conditions caused such plants to grow during summer, virescence occurred in some species. Spread by vegetative propagation of infected plants before symptoms appeared was observed in chrysanthemums and dahlias. As a rule, the first flowers produced by infected spring-flowering perennials, and sometimes flowers produced in late autumn, appeared healthy, but during the warmer period all were virescent. In most plants, the symptoms develop chiefly in the flowering parts, hence in some biennials the disease, though present, may not be apparent during the first season. This is important where parsnips, carrots, and celery are grown for seed.

The disease was readily transmitted by grafting infected tomato, tobacco, egg-plant, black nightshade (*Solanum opacum*), or common thorn apple (*Datura stramonium*) to healthy plants of each of these species. It was not transmitted when scions from non-solanaceous virescent plants were grafted with healthy host plants susceptible to big bud. It was, however, obtained by grafting from phlox to phlox and from *Antirrhinum* to *Antirrhinum*.

It was transmitted experimentally by nymphs or adults of the jassid *Thamnotettix argentata* to 23 species of plants belonging to 13 families. The symptoms appeared in 24 to 155 days, this interval largely depending on the length of the period between infection and flowering and on the season of the year. In many plants, the condition was accompanied by the development of axillary buds into short branches bearing numerous small leaves with short petioles, the affected plant assuming a compact, stunted appearance. In many cases the floral axis of diseased flowers continued to elongate, and further differentiation occurred until the floral axis resembled a stem with virescent flowers or clusters of small, leaf-like structures at intervals along its length.

Bawden (F. C.) & Pirie (N. W.). **Methods for the purification of Tomato bushy stunt and Tobacco mosaic viruses.**—*Bio-chem. J.*, xxxvii, 1, pp. 66–70, 1943.

The authors describe new and improved methods of purification of tomato bushy stunt [*R.A.M.*, xviii, p. 143] and tobacco mosaic [ibid., xvii, p. 564] viruses, which involve only ordinary low-speed centrifugation. The bushy stunt virus prepared by the new method, involving no heating, is stated to be at least 10 times as infective as virus made by the method involving heating [see next abstract]. As the virus content of infected tomato leaves is at least five times as great as that of the stems, the inclusion of the latter in the preparation is not considered advisable, particularly since it greatly increases the labour of mincing. Freezing the leaves facilitates subsequent mincing, but seems to have no further advantages; there is no evidence that it causes loss of virus.

The method described for the purification of tobacco mosaic and aucuba mosaic viruses is considered satisfactory, there being no evidence of any great inactivation. The authors' view that preparations of tobacco mosaic virus are not homogeneous and consist of rods of equal cross-section but variable length, has received support from Frampton's measurements [ibid., xxi, p. 307].

Bawden (F. C.) & Pirie (N. W.). **The inactivation of Tomato bushy stunt virus by heating and freezing.**—*Bio-chem. J.*, xxxvii, 1, pp. 70–79, 1943.

Heating purified preparations of tomato bushy stunt virus [see preceding abstract] at P_H 6 for 10 minutes to a temperature of 85° [C.] was found to result in complete loss of infectivity; partial loss occurred over a wide range of temperatures (from 45° to 80°, but mostly below 60°). On the other hand, loss of serological activity, accompanied by coagulation, took place only within the narrow temperature limits of 80° to 85°. The amount of heating needed for denaturation was lower at P_H 4 than at the higher values within the range of 4 to 9. The chemical and physical properties of virus material rendered non-infective by an amount of heating insufficient to destroy its serological activity, did not differ in any way from those of fully active preparations.

The rate and extent of inactivation induced by freezing was intensified by increases in the concentration of the virus, the duration of freezing, and the acidity of the fluid. Salts and other substances present protected the virus from inactivation, the efficiency of different salts depending on the salt : ice : water eutectic temperature. In general, loss of infectivity in frozen samples of the virus was accompanied by a corresponding loss of serological activity, but under certain, as yet not fully defined, conditions freezing destroyed the infectivity without affecting the serological activity.

In conclusion it is suggested that since so many treatments seem to destroy infectivity without altering the physical, chemical, or serological properties of a virus, attempts to assess the homogeneity of purified virus preparations are likely to give indecisive results until much more sensitive methods of testing for infectivity are evolved.

Stuntz (D. E.) & Seliskar (C. E.). **A stem canker of Dogwood and Madrona.**—*Mycologia*, xxxv, 2, pp. 207–221, 6 figs., 1943.

During the past few years *Cornus nuttallii* and *Arbutus menziesii* trees in and in the vicinity of Seattle have become increasingly affected by cankers which girdle the stem and eventually prove fatal. The leaves in the top of the crown turn brown and fall, this being followed by complete defoliation and the ultimate death of the tree. The condition in the crown is reflected in the cankerous condition of the stem.

Bits of tissue from cankers on both tree species were incubated, and two organisms were obtained, a *Phomopsis*, later found to be a secondary parasite, and a

species of *Phytophthora*, identified as *P. cactorum* [cf. *R.A.M.*, xvii, p. 182]. This is the first record of *P. cactorum* on these two hosts.

Thirteen of 16 stem inoculations on *C. nuttallii* produced characteristic cankers, while four soil inoculations failed. On *A. menziesii* 15 of 16 stem inoculations gave positive results, as did two of four soil inoculations. The fungus was also found by inoculation tests to be quite virulent on *Acer macrophyllum*, and able to attack *Pseudotsuga taxifolia*, *Alnus rubra*, *Salix scouleriana*, and *Corylus californica*. Both inoculation tests and field observations indicated that it is more pathogenic to *Arbutus menziesii* than to *Cornus nuttallii*. Re-isolations from the experimentally induced cankers on both of the last-named were identical with the original pathogen. Scarification of the artificially induced cankers has so far prevented further spread.

Large (J. R.). **Recent observations on threadblight, Corticium stevensii, of Tung and some native plants in the southeastern United States.**—*Plant Dis. Reptr*, xxvii, 10–11, pp. 223–224, 1943. [Mimeographed.]

Thread blight due to *Corticium stevensii* [*R.A.M.*, xxii, p. 33] is one of the most serious diseases of tung [*Aleurites* spp.] trees in the United States. It has been reported on at least 20 southern hosts, including tung, at Gainesville, Florida. Records on tung include one from Florida, five from Louisiana, and one from Mississippi. Most of the infected orchards are near swamps, and in two swamps in Louisiana *Liquidambar styraciflua*, *Nyssa sylvatica*, *Cornus florida*, *Malus angustifolia*, *Rubus* sp., *Aquilegia canadensis*, *Ilex opaca*, and *I. glabra* were found infected.

Pruning and burning the affected shoots at weekly intervals from June to October kept a serious epidemic in check in one orchard. Summer sprays of Bordeaux mixture (6-6–100) plus 1 per cent. summer oil or of Bordeaux mixture (6–2–100) reduced infection both in severity and extent to about one-third. The best time to spray seemed to be June. Annual spraying is uneconomical. It is recommended that one or two summer sprays of Bordeaux mixture (6–2–100) should be given, followed after 30 days by the pruning-out of any diseased twigs remaining.

Tehon (L. R.). **Diseases of trees. Gleanings from the latest reports of scientific research.**—*Amer. Nurserym.*, lxxvi, 10, pp. 28–29, 1942.

The results of tests conducted by W. C. George in North and South Carolina and Georgia since 1937 have shown that damping-off, chiefly due to *Rhizoctonia* [*Corticium solani*: *R.A.M.*, xix, p. 681: xxi, p. 508; xxii, p. 158], of longleaf pine [*Pinus palustris*] can be adequately combated by the use of a shallow ($\frac{1}{4}$ in. thick) seed cover of old pine sawdust and the application to the seedlings of semesan at the rate of $\frac{1}{10}$ oz. in $\frac{3}{4}$ pt. water per sq. ft., which in one test reduced the incidence of infection from 50 to 10 per cent. The compound is apt to cause scorching, and treatments should only be made in the late afternoon or on cloudy days. In some cases the introduction into the soil, before sowing, of iron sulphate ($\frac{3}{8}$ oz. in 1 pt. water per sq. ft.) has given satisfactory results, while commercial ortho-phosphoric acid ($\frac{1}{8}$ fluid oz. per sq. ft.) was also partially effective, and a combination of these two materials, both of which operate by changing the acidity of the upper $\frac{1}{2}$ in. of soil, holds some promise.

Southam (C. M.) & Ehrlich (J.). **Effects of extract of Western Red-Cedar heartwood on certain wood-decaying fungi in culture.**—*Phytopathology*, xxxiii, 6, pp. 517–524, 1 fig., 1943.

In studies on the effects of western red cedar (*Thuja plicata*) heartwood extract on the growth of wood-destroying fungi in culture, hot water-soluble extractives were mixed in various concentrations (from $\frac{1}{4}$ to 24 per cent.) with malt agar

medium on which the following fungi were then grown: *Trametes serialis, Fomes roseus, T. subrosea,* 'Madison 517', *Lentinus lepideus, Polyporus sulphureus, F. officinalis, P. schweinitzii, F. pinicola, Coniophora puteana,* and *Poria xantha* f. *crassa.*

The results showed that when the concentration of the extract was 4 per cent. or more, the growth rate of all the fungi was retarded, while somewhat higher concentrations completely prevented growth. When the non-growing pieces were removed after the test period to ordinary malt agar medium it was found that some, but not all, of the transfers grew. In extreme dilutions of the extract many of the fungi showed an increase in growth rate, though this gradually decreased and approached the normal rate. Fungistasis decreased with time, and when transfers were made from malt agar containing the highest percentage of extract on which each fungus originally grew to a somewhat higher percentage of extract, it was found that each fungus had become able to grow on these higher concentrations, from which they could be re-transferred to even higher ones.

In media containing extract a zone of decoloration was noted, extending 1 cm. or less beyond the periphery of the mycelium of *F. officinalis, F. pinicola, P. xantha* f. *crassa,* and *T. serialis.* This is considered to have resulted from the leaching of metabolic products from the fungus into the surrounding medium. Apparently, the fungi producing the decoloration change chemically the toxic portion of the extract to a non-toxic material before advancing. Ability to overcome increasingly high concentrations of the toxic heartwood extract in this manner may account for the advance of decay-producing fungi through the heartwood of living western red cedar trees.

Boyce (J. S.) & Hepting (G. H.). **Decay of wood in aircraft.**—*Spec. Release Div. For. Path. U.S. Dep. Agric.* 12, 4 pp., 1943.

Examination of over 50 older commercial and private aeroplanes showed that decay [unspecified] in wooden parts is infrequent in spite of the fact that susceptible woods are being used without preservative treatments. Where decay has occurred, it has almost invariably been due to faulty design, carelessness in construction, or improper care. As there is no authenticated record of wood decay having occurred at moisture content below 25 per cent., aeroplane construction should aim at keeping water out by shielding all openings and drain holes, as well as by providing sufficient numbers of the latter to let water escape. In maintenance, wood should be protected from water by improving the drainage of air fields, by using water sparingly in washing, and by clearing drain holes that have become clogged.

Lohmeyer. **Fäulniserscheinungen an unter Wasser eingebautem Holz.** [Symptoms of decay on submerged constructional timber.]—*Bautechnik,* xx, 29-30, pp. 270–272, 1942.

It is only of recent years that the danger of fungal infection on submerged constructional timbers, e.g., bulwarks, piles, bridges, sluices, and the like has been recognized. In Sweden, for instance, T. Lagerberg has investigated cases of decay in entirely submerged wooden structures, which point to the implication of organisms rendered resistant to the ordinarily inhibitive effect of water on fungal development, possibly by the accumulation of oxygen-containing humus. These observations have thrown light on the occurrence of a number of similar cases in Germany, particulars of which are presented in tabular form.

Bond (T. E. T.). **'White spot' of Turnips: a disease new to Ceylon.** *Trop. Agriculturist,* xcviii, 4, pp. 17–18, 1 pl., 1942.

In December, 1942, turnips in a garden at St. Coombs, Talawakele, Ceylon

(4,500 ft.), were observed to be affected by white spot due to *Cercosporella brassicae* [*R.A.M.*, xvii, p. 587], not previously reported from the island. The spores measured 44·5 to 89·5 by 2 to 3 (mean of 50, 64·9±1·47 by 2·4±0·05) μ. The disease can be controlled by removing the affected leaves or, in severe cases, by spraying with a copper emulsion. The suddenness of the outbreak and its occurrence in a bed of young plants grown from recently imported seed suggest that the disease may have originated in a contaminated seed supply. Seed from affected plants should not be used.

LORENZ (O. A.). **Internal breakdown of table Beets.**—*Mem. Cornell agric. Exp. Sta.* 246, 42 pp., 7 pl., 1 fig., 4 graphs, 1942.

Further studies (under greenhouse conditions) on internal breakdown of beets [*R.A.M.*, xxi, p. 114] showed that when the soil remained at a low moisture content only slight injury to the plants was caused by borax applications even at 300 lb. per acre, though when soil moisture was high a rate of 100 lb. was toxic. A broadcast application of 50 lb. per acre was injurious to young seedlings in a moist soil. Plants in soil kept at a low moisture content but supplied with 200 lb. borax per acre showed characteristic symptoms of boron deficiency. Germination of beet seeds in moist soil remained unaffected when borax was applied broadcast at the rate of 300 lb. per acre.

Interaction was observed between boron and calcium. Growth was increased above that produced in solutions containing 0·01 p.p.m. boron and 10 p.p.m. calcium when the boron concentration was increased without increase in the calcium concentration, or when the calcium concentration was increased without increase in the boron concentration. Boron increments increased growth more effectively at lower than at higher calcium levels. When boron increments at any calcium level were associated with increased growth, they were also associated with greater calcium absorption. Growth was as good for beets grown with the smallest amount of calcium but with the largest of boron as it was for beets grown with less boron but more calcium where 15 times the amount of calcium was absorbed. Hence growth evidently depended not on calcium absorption but probably on calcium utilization.

In a second boron-calcium test conducted in the same manner but with less exposure to light, the growth increase after the plants were transferred from Hoagland solution to one containing 0·01 p.p.m. boron and 10 p.p.m. calcium was 6·92 gm. compared with only 3·47 gm. in the first. Possibly, much of the calcium supplied in the second experiment was utilized, even when the boron concentration in the nutrient solution was low. In the second test, as in the first, calcium utilization was increased at a low level by raising the boron concentration from 0·01 to 10 p.p.m., a result which suggests that boron played some part in calcium utilization even with reduced light.

In a boron-potassium test, increased growth resulted from increase in the concentration of either boron or potassium above the amount in the solution containing 0·025 p.p.m. boron and 14·7 p.p.m. potassium. All plants in solutions with 14·7 p.p.m. potassium developed marginal yellowing of the leaves, while nearly all plants with 0·025 p.p.m. boron showed boron deficiency symptoms, whatever the potassium supply. The boron increments increased growth more effectively at the higher than at the lower potassium levels. With any boron level, growth was directly related to the amount of potassium lost from the solution, but it was not dependent on potassium absorption. Growth in solutions containing 0·150 p.p.m. boron where only 200 mg. potassium were removed was as good as in solutions containing 0·025 p.p.m. boron where seven times that amount of potassium were removed.

Chemical analyses of normal and breakdown tissues in the same beet showed

no consistent differences in dry weight as per cent. of fresh between the two kinds of tissue. On a basis of dry-weight determinations, ash, calcium, magnesium, phosphorus, and iron accumulated in considerable quantities in the breakdown areas, but potassium accumulation was smaller than that of the other minerals. The affected tissue was higher than normal tissue in percentage of total nitrogen and protein nitrogen, but small difference was found between the two kinds of tissue in soluble nitrogen. Total sugars, sucrose, and alcohol-soluble solids were higher in normal tissue, while reducing sugars and starch were higher in the breakdown tissue.

Chemical analyses of plant samples of whole beets from field soils that had received no borax and field soils given borax at rates of 12·5, 25, 50, and 75 lb. per acre, and with boron-deficiency symptoms ranging from severe to almost nil, showed no consistent differences in ash constituents, nitrogen fractions, or carbohydrates, except that reducing sugars accumulated in the roots of the boron-deficient plants.

Microchemical studies demonstrated that boron deficiency was associated with reduction of pectic-staining materials in the intercellular spaces, and later a reduction of cellulose-staining materials.

Anatomical symptoms of boron deficiency generally first appeared in the parenchymatous tissues and vessels in the petioles of the younger leaves. The intercellular substance of the parenchymatous tissue became discoloured, and this was followed by accumulation of a brown gum-like substance in this area. Other symptoms in the tops included plugging of some of the vessels of the petioles and leaf veins with a similar gummy material, changes in the growing point, anthocyanin accumulation in the leaves, and hypertrophy and disintegration of the palisade parenchyma. In the root, boron deficiency produced disintegration of parenchymatous tissue, generally near the xylem, hypertrophy of xylem parenchyma, lack of differentiation of some vascular bundles, restricted growth of secondary roots, and a deposition of gum-like matter in the intercellular spaces of the parenchymatous tissues and in the vessels.

Yu (T. F.). **The relation of soil temperature to pathogenicity of Rhizoctonia solani Kühn on Broad Bean seedlings.**—*Nanking J.*, ix, pp. 269–280, 1940.

Rhizoctonia [*Corticium*] *solani* causes severe infection of the hypocotyl and destruction of the plumule of broad beans in Kiangsu, where up to 80 per cent. of the plants may be killed before emergence.

The optimal temperature for infection was determined by growing the plants in non-sterilized garden soil in which had been mixed vigorously growing cultures of the fungus. Infection was found to take place at temperatures ranging from 6° to 31° C. being most severe at 16° to 20°. The optimal temperature for growth of the fungus, as determined by linear growth rate on 1 per cent. potato dextrose agar, was 22° to 28° and the range about 6° to 30°. The optimal temperature for seedling germination, as indicated by the number of seedlings producing roots and hypocotyls, and the average length of the hypocotyl, was found to lie between 26·7° and 28°, and the range to exceed 15·6° to 28°. The author concludes that the effect of increasing temperature on infection is to be explained by an increase in the physiological activities of the host plant, which indirectly restricts the degree of infection, and not by the increased growth rate of the hypocotyl, which is comparatively small for the increase in temperature, markedly reducing infection. Late planting of beans in the affected regions should be avoided.

Altstatt (G. E.) & Smith (H. P.). **Production, diseases, and insects of Garlic in Texas.**—*Circ. Tex. agric. Exp. Sta.* 98, 13 pp., 7 figs., 1942.

Brief, popular notes on the following diseases of garlic in Texas are given in this circular, viz., bulb rots (associated with *Bacillus carotovorus* [*Erwinia caroto-*

vora], *Aspergillus* spp., *Penicillium* spp., *Fusarium* spp., *Diplodia* sp., *Helminthosporium* spp., *Trichoderma* spp., *Sclerotium bataticola* [*Macrophomina phaseoli*], and *S. rolfsii*), mosaic, pink root (*Phoma terrestris* [*R.A.M.*, xii, p. 547], possibly in association with *F. malli* [*F. solani*]), southern blight (*S. rolfsii*), and 'splits'.

Bulb rots can be avoided by making sure that the plants are mature before they are pulled, and sufficiently cured before storage. Storage places should be adequately ventilated, and the containers should be placed so that air can freely circulate about them. If clean bulbs are not obtainable for planting, the cloves should be disinfected before being planted with an organic mercury dust, such as semesan, at the rate of about 3 oz. per bush. or by dipping in a solution of mercuric chloride (1 in 1,000).

Mosaic is becoming increasingly prevalent. Affected plants are small and yield only about 60 per cent. as much as healthy ones. The condition is transmitted with the cloves. Affected plants should be pulled out and destroyed directly the symptoms appear, and, in addition, garlic destined for seed purposes should be grown in a separate block.

Pink root is not serious in the chief garlic-producing areas of Texas. Garlic and onions should not be grown in the same rotation.

Southern blight develops mainly in light, sandy soils. If the fungus is present, root crops, tomatoes, and melons should not be planted in the rotation with garlic.

Splitting of the bulbs generally results from leaving the plants in the soil too long after maturity, with the result that soil organisms attack the outer scales. Growers should reject split bulbs when selecting stock for planting.

LINDFORS (T.). **Bekämpa Lökmöglet!** [Control Leek mildew!]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, vii, 2, pp. 1–3, 1943.

In some parts of Sweden, e.g., Gothland and Öland, the ravages of downy mildew [*Peronospora destructor*] have largely frustrated attempts at leek cultivation on a commercial scale. The disease may be combated by spraying with 2 per cent. Bordeaux mixture or Ob 2300, plus a spreader, newly placed on the market by A. B. Lauxein-Casco and known as 'spridex'.

JOHNSON (H. W.) & KOEHLER (B.). **Soybean diseases and their control.**—*Fmrs' Bull. U.S. Dep. Agric.* 1937, 24 pp., 16 figs., 1943.

Short, popular notes are given on soy-bean diseases in the United States, including bacterial blight (*Pseudomonas glycinea*) [*R.A.M.*, xix, p. 256], bacterial pustule (*Xanthomonas phaseoli* var. *sojense*) [loc. cit.], pod and stem blight (*Diaporthe sojae*) [*D. phaseolorum* var. *sojae*: ibid., xiii, p. 270], frog eye (*Cercospora daizu*) [ibid., xix, p. 256], brown spot (*Septoria glycines*) [ibid., xix, p. 452], anthracnose (*Glomerella glycines*) [ibid., xix, p. 512], downy mildew (*Peronospora manshurica*) [ibid., xxi, p. 361], powdery mildew (probably due to *Erysiphe polygoni*) [ibid., xi, p. 19], leaf spot due to a species of *Alternaria*, arsenical injury, mosaic [ibid., xx, p. 444; xxi, p. 388], chlorosis due to deficiency of potash [ibid., xviii, p. 54], iron, or nitrogen, seed discolorations associated, apparently, with a species of *Cercospora* and *Alternaria*, charcoal rot (*Sclerotium bataticola*) [*Macrophomina phaseoli*; ibid., xix, pp. 254, 260], sclerotial blight (*Sclerotium rolfsii*) [ibid., xix, p. 256], stem rot (*Sclerotinia sclerotiorum*) [ibid., xvi, p. 585; xix, p. 192], *Fusarium* blight (*F. oxysporum* f. *tracheiphilum*) [cf. ibid., xix, p. 256], root rot (*Pythium de Baryanum*) [loc. cit.], *Rhizoctonia* root rot (*R.* [*Corticium*] *solani*) [ibid., xxi, p. 515], *Phymatotrichum* root rot (*P. omnivorum*), and lightning injury.

Up to the present, soy-beans in the United States have remained relatively free from any serious epidemic, except for widespread infection in the south by *Sclerotium rolfsii*. The most conspicuous and widespread diseases are probably

Pseudomonas glycinea and *X. phaseoli* var. *sojense*, while *D. phaseolorum* var. *sojae* is becoming increasingly common in the corn belt states, where it constitutes a distinct menace to production.

Control is dealt with in relation to the diseases considered separately and is also discussed in a final section, in which the planting of resistant varieties [which are indicated] and rotation with forage grasses or cereals are recommended, while it is stated that seed treatments sometimes improve the stand.

Weiss (M. G.). **Inheritance and physiology of efficiency in iron utilization in Soybeans.**—*Genetics*, xxviii, 3, pp. 253–268, 1 pl., 1943.

Marked differences in chlorosis typical of iron deficiency were observed at the Iowa Agricultural Experiment Station in 1938 among soy-bean varieties tested on calcareous soils for the first time since their introduction into the United States from Manchuria. Tests of these varieties in nutrient solution cultures and in sub-irrigated crushed quartz media showed that this differential performance could be induced by growing the plants on media with a low concentration of available iron. On such substrata, varieties which were 'efficient' in iron utilization made normal, green growth, while 'inefficient' ones developed severe chlorosis symptomatic of iron deficiency, ultimately resulting in the death of the plants.

On the basis of F_2 and F_3 populations of crosses between four 'efficient' (Dunfield, Mandell, Klini, and Mukden), and six 'inefficient' (FPI.54619–5–1, FPI.88508, FPI.88358, FPI.88294, FPI.87617, and FPI.88354) varieties, differences in the capacity for iron utilization were shown to be conditioned by a single gene. 'Inefficiency' of F_1 plants from all crosses among the six 'inefficient' varieties established allelism of the recessive gene responsible for the condition, to which the symbol *fe* was assigned, 'efficiency' being represented by *Fe*. The performance of F_1 plants from crosses between 'efficient' and 'inefficient' varieties indicated complete dominance of the *Fe* allele. Analyses of the plant tissues of individuals inheriting 'inefficiency' in respect of iron utilization revealed a relatively higher P_H, lower soluble iron, higher total iron, and lower potassium content.

Pizer (N. H.) & Glasscock (H. H.). **Experiments to determine the effect of certain wood preservatives on the growth and cropping of the cultivated Mushroom (Psalliota campestris).**—*Ann. appl. Biol.*, xxx, 2, pp. 128–131, 1943.

In small-scale laboratory trials with a number of well-known wood preservatives tested for use in mushroom houses, no adverse effect on mycelial growth or on cropping of the cultivated mushroom resulted from wood treatments with 5 per cent. copper sulphate solution, green cuprinol, 5 per cent. celcure solution [*R.A.M.*, xxii, p. 48], or 2 per cent. triolith (Wolman salts) solution. Wood treatments with 2 per cent. chromel salt or coal-tar creosote, on the other hand, reduced the vigour of growth of mushroom mycelium to a depth of $\frac{1}{2}$ in. in compost above the treated wood, although they did not kill the mycelium or reduce the cropping even when the treated wood was only $1\frac{1}{2}$ in. below the casing soil. None of the treatments seemed to inhibit the production of sporophores. It is pointed out, however, that under the conditions of the experiment, where the treated wood was covered with compost, the likelihood of vapours from the wood preservatives coming into contact with sporophores was very small, and that, in general, the possibility of harmful effects from such vapours should not be ignored. The authors conclude that full-scale trials in commercial houses could now be undertaken with copper sulphate, green cuprinol, celcure, and triolith with negligible risk to the crop, but advise further small-scale trials with chromel and coal tar creosote. It is pointed out that owing to the wide range in composition shown by coal tar creosote, the results obtained by the authors with the particular sample of this material used should not be expected to apply to creosotes in general.